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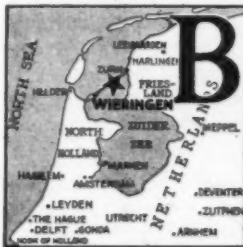
Contractors and Engineers Monthly

August,
1928

Methods Employed in Enclosing and the Partial Reclaiming of the Zuiderzee

By J. F. M. Alma

Engineer, Maatschappij tot Uitveering van Zuiderzeewerken, Wieringen, Holland



BEFORE any details regarding the equipment employed in the reclaiming of the Zuiderzee can be given, a few words must be recorded regarding the general plans. The enclosing dyke, as shown in the diagram, extends from Wieringen to the Friesland coast near the small town of Zurig.

Wieringen was connected to the North Holland coast in 1922 by dyke. The length of the enclosing dyke is 18.6 miles, the location and a cross section of which are in the first illustration. The enclosing dyke is constructed of a layer of very hard compact boulder clay on the exterior side, behind which is sand covered with a layer of clay. Outside, as well as on the inside, stone facings are constructed up to the high water mark. Below low water the covering consists of brushwood mattresses covered with stone. The top of the dyke reaches an average height of 23.78 feet above normal Amsterdam water level.

SLUICES AND LOCKS

It is anticipated that no waves will ever reach the top of the dyke. In the enclosing dyke, sluice gates have been designed for carrying off the water from the reclaimed part of the Zuiderzee. These sluice gates will be constructed at two points. One will be built at about 2.17 miles from the Frisian coast, the other near Wieringen. The latter will be connected with the workport which is already established. The Wieringen sluices will consist of three groups of five sluice gates each and the Zurig sluices will consist of two groups of five sluice gates. Each gate will have a width of 39.36 feet giving a total sluicing width of about 984 feet.

In order that shipping may be handled expeditiously, a large lock is being constructed in conjunction with both the eastern and western series of sluice gates. These locks will be capable of handling vessels for interior navigation with a loading capacity up to 2000

tons. At the eastern group there will be a smaller additional lock for handling vessels up to 600 tons.

POLDER DYKES

The system of reclaiming the Zuiderzee includes not only the major enclosing dyke, but the subdivision of the area to be reclaimed into smaller sections or polders each enclosed with a separate dyke. The four polders which are now being reclaimed aggregate 552,504 acres. The polder dykes are being built suf-



Map of the Area Affected by Enclosing Dyke Across Zuiderzee and Showing the Various Polders. All Measurements on This Map Are Meters



Aerial View of the Workport on Oude Zeug Under Construction

ficiently high and with sufficient strength to be capable of resisting the water even if the enclosing dyke should collapse during a gale.

The canals which extend along the coast and into lakes were also designed for drainage as well as for handling shipping which will benefit the coastal districts.

The remaining lake, the IJssel lake will have an area large enough to store the water of the river IJssel which has a flow equal to about one-ninth of the river Rhine.

BENEFITS ACCRUING

The benefits of the design of the dyke system outlined above in large measure control the rate of construction and the sequence of execution of the different parts of the work. Benefits resulting from enclosing the Zuiderzee are chiefly the betterment of the hydrographical conditions of the districts surrounding it. The creation of a fresh water lake, the new IJssel lake, will materially improve the agricultural conditions especially of the provinces of North Holland and Friesland. The now existing sea-dykes will no longer be used and thus heavy annual repair costs will be saved.

These benefits have led to pushing the work on the enclosing dyke and simultaneously to begin the reclaiming of the North-Western, the so-called Lake Wieringen Polder. This last proposal was based on the consideration that a part of the reclaimed land should be made profitable as soon as possible so as to meet a portion of the expenses of the enclosing dyke.

CONSTRUCTION ORGANIZATION

For the execution of the work on the enclosing dyke and the dyke of the Lake Wieringen Polder, a company, Maatschappij tot Uitvoering van Zuiderzeewerken, meaning company for the reclaiming of the Zuiderzee, has been formed, consisting of the four largest contracting firms in Holland. This large construction organization has already been working for more than a year at different parts of the Zuiderzee. It is estimated that the work on the enclosing dyke will be completed in seven years and the Lake Wieringen dyke in three years.

CONSTRUCTION PROCEDURE

Because of the tidal movements large quantities of water are forced through between the Wadden Islands into the Zuiderzee with the result that several deep

channels have been formed where strong currents exist. The line of the enclosing dyke is cut by these channels. At the shallower portions the depth of water is only from 10 to 16 feet.

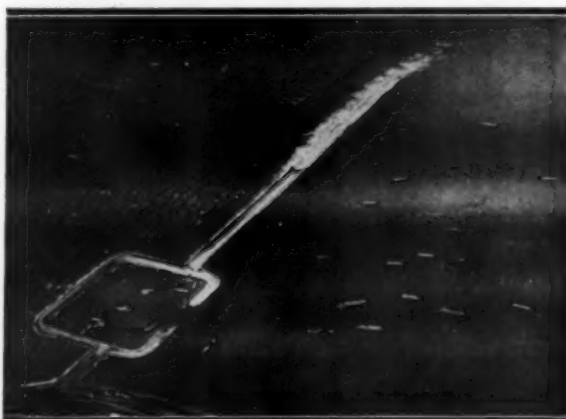
Most of the water movement takes place at the channels so there is hardly any current at the shallower portions. For this reason, it was decided to build the dyke in parts, the shallower portions first, so as to have as little hindrance from the currents as possible. The islands formed in this way will be strengthened with stone facings at both ends so as to prevent the loss of material and labor during stormy weather. At the same time the deeper channels will be controlled by dams built of boulder clay covered with brushwood mattresses and heavy stone. This material will act as a foundation for later construction of the dyke at that location. As would seem natural and as has been shown from models of the dykes the current at the head of the dyke will increase in strength as the opening grows smaller and, following extensive calculations, the maximum strength of the current will be 21.32 feet per second when the sum of the openings is about 3936 feet, that is, four openings of 984 feet each. The critical length of the last part to be closed is some 3.27 miles. Before this stage is reached the currents will do no great harm and also after each opening has been reduced to 984 feet the most difficult part is finished as the contraction of the moving water behind the opening will be a factor which makes the remainder of the closing somewhat easier.

WORK IN 1927

In accordance with the plan of work laid out, in 1927 the following work was undertaken: first, the sluice island which is part of the enclosing dyke situated on the Kornwerderzand, near the Frisian Coast; second, a small work port, part of the Wieringen dyke, situated on the Oude Zeug, about half way between Medemblik and Wieringen; third, a pit for the foundation of the pump house and a 3.72-mile dyke near Medemblik; fourth, the foundation of the sluices and lock in the already existing pit at Wieringen.

1928 ACTIVITIES

During the present year similar foundation works are under way and will be completed in the pit sluice-island Kornwerderzand which is now closed in and



Airplane Photograph of the Encircling Dyke for the Foundation Pit of the Pump House Near Medemblik



The Island Where Sluices Are to Be Constructed at Kornwerderdijk Nearly Completed

pumped dry. The sluice-island is being joined to the Frisian coast by a 2.17-mile portion of the enclosing dyke. The 4.34-mile dyke between Wieringen and Medemblik will be completed before the close of 1929. In 1929 also at about the middle of the enclosing dyke an island with large storage grounds and two large work ports will be completed and after that the work will advance so as to be completed in 1933.

EQUIPMENT USED

No small or weak equipment can be employed on this project as can be seen by considering the comparatively small dyke between Wieringen and Medemblik, in which 2,620,000 cubic yards of boulder clay and 3,275,000 cubic yards of sand are required.

The boulder clay is dredged by bucket dredges using buckets with a capacity of approximately $\frac{3}{4}$ -yard. The boulder clay is dredged out of the channels where the tidal currents have removed the covering of sand and where it is found at a depth of approximately 33 feet. The dredger works at depths from 52 to 59 feet. A great drawback to the work is that the places where the boulder clay is found are sometimes more than 11 miles from the enclosing dyke so that the transportation by barges takes a long time and many difficulties arise because no messages can be sent to the dredgers. Only recently have investigations begun to install several wireless stations and receiving sets which will greatly improve transportation conditions. Barges towed by tugs are used to bring the material from the dredges to the site of the dykes. The self-emptying barges have capacities of 196.5 cubic yards, while the elevator barges can handle from 327.5 to 393 cubic yards.

The speed of a tug and barge is very much determined by the water current and winds, but averages about 4.5 miles per hour. The barges of boulder clay are emptied into the sea at the site of the dyke by special doors in the bottom of the barges. These trap doors can be used as long as there is 5.74 feet of water. Otherwise the barges are emptied by cranes. The cranes in use have a reach of 65.6 feet and a grab capacity of 10 tons or about 4.59 cubic yards of boulder clay. The cranes are mounted on pontoons. When conditions are favorable, these cranes handle between 11,790 and 13,100 cubic yards of boulder clay per week. Since the clay is very heavy and sticky it can only be

worked satisfactorily by floating cranes.

There are other types of machinery also in use in producing the clay cover. The first is a so-called long-arm crane which has a reach of 98.4 feet and uses a grab of 1.97 cubic yards. With this crane it is possible to reach over the top of the dyke and dispose of the load at the inside. There are several types of conveyors in use. One of them scrapes the boulder clay from the barges by means of a bucket chain and throws it on a rubber belt conveyor which runs over a 98.4 foot boom from where the clay is thrown in heaps on the top of the dyke. This method is found to cost about only one-fifth of the cost of transportation by men with wheelbarrows.

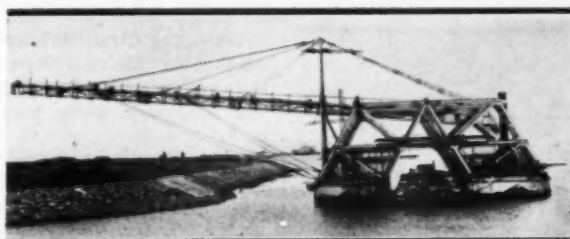
Another type of equipment used is a long horizontal boom mounted on two barges which are held at some distance apart. The barge filled with boulder clay is brought between the two barges on which the boom is mounted. The bucket fills itself, moves out the boom and is emptied at the end of the boom behind the top of the dyke.

SAND DREDGING

For stone handling other types of cranes have been used. Sand is produced by suction dredges of different sizes. The suction pipe is usually about 23.6 inches in diameter and the working depth about 98 feet. As there is considerable difficulty in securing good sand, no storage hoppers are used and the suction dredge usually remains at about the same place throughout its operations.

The sand is transported by barges which have a capacity varying from 196.5 to 524 cubic yards. As there are many places in the Zuiderzee where there is only $2\frac{1}{2}$ to 4 feet of water the capacity of the clay and sand barges is naturally limited. The sand is deposited behind the dam wall up to about 2 feet under the water level. After that the remainder of the sand is brought into place by dredge pumps reclaiming locally.

When weather conditions are favorable, a suction dredge will produce up to 65,500 cubic yards a week,



Horizontal Boom Mounted on Two Barges, Between Which the Barge of Boulder Clay is Floated and Emptied by a Drag Bucket



Floating Crane Depositing Boulder Clay on Top of the Dike



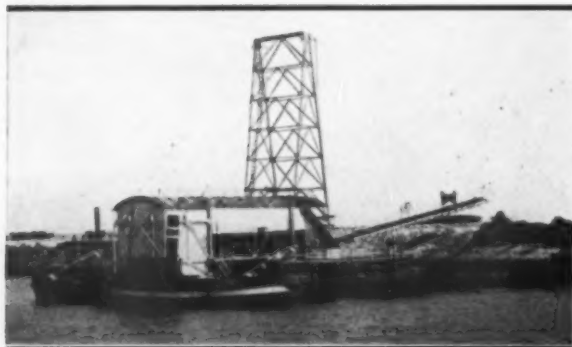
The Suction Dredge Method of Emptying a Barge Load of Sand

while a suction pump does not handle more than 26,200 cubic yards a week.

The construction of the brushwood mattresses and the sinking is all handled by skilled labor.

BAD TIDAL CONDITIONS

The fact that more than once the figures are given only when conditions are favorable is an indication that unfavorable conditions occur more often than anybody concerned with this huge project likes. There are climatic conditions such as winds, fog, heavy rain



Barge Unloading Boulder Clay by Means of a Chain of Buckets and Belt Conveyor

and abnormal high and low tides, there are the often occurring stops because of the breaking of machinery parts.

There is also the difficulty already mentioned in the organization of the transportation of the boulder clay and sand to the dykes, owing to shallow water, storms or heavy winds producing enormous waves which not only make it dangerous but often impossible for a tug or barge to draw near to dredge or a crane because of the danger of being smashed.

Fogs have the known tendency to lead boats astray and to land them on sand banks where they have to wait until high water rescues them. These facts have the result of making the work much more expensive than was estimated. To the cost of producing a cubic yard of boulder clay must be added heavy transportation costs and disproportionate costs for the hire of barges and boats because of the practical impossibility of organizing transportation in an orderly manner.

This huge work demands a very precise organization and when one of the many wheels is broken the whole work is slowed up. To control and influence the execution of the work and extensive administration, de-

tailed reports are required. All captains of dredges and boats and all drivers of cranes and suction pumps make daily reports of the work done. From these reports diagrams are made which show the production of the different machines and the progress of the work. A large staff of engineers and executives controls the work and an extensive administration is conducted to figure costs and make estimates.

The ultimate result of this vast engineering and construction project will be the creation of four new provinces of fertile land, and extensive opportunity for work for the unemployed, both of which will be a boon for the kingdom of the Netherlands.

Motor Trucks in Building of New Jersey Boulevard

IN road construction unusual demands are sometimes made on motor trucks, but modern day trucks are sturdily constructed and so designed as to meet various emergencies when extra effort is expected of them in this class of work. Trucks with their heavy loads must often go into deep pits, up and down steep hills and over stretches of temporary road filled with ruts and soft places. They are called upon to carry such heavy materials as machinery, cement, gravel, sand, etc., and, although it is strenuous work for them, they do it unflinchingly and at low cost.

When the Crescent Boulevard, which connects the Delaware River Bridge between Philadelphia and Camden with the new main highways leading to New Jersey shore resorts, was being built, motor trucks faithfully performed a variety of heavy hauling jobs. In one of these they had to descend 55 feet below ground level into sand and gravel pits and then pull out with their heavy loads. A number of 3-ton dump trucks equipped with dual pneumatic tires were used on this work. When in the pits, the trucks were subjected to extraordinary hard going. Loaded with sand and gravel and carrying their loads over rutted and uncertain paths, the trucks pulled out even during rain and worked from 10 to 12 hours per day.

The astounding stamina of modern trucks from the seemingly frail 1-ton truck to the monster 10-ton trucks that calmly haul their great loads both to and from vast construction projects is the product of boundless research.



Gasoline Shovel of the Crawler Type Loading an International Truck Deep in a Sand Pit Near Camden, N. J.

Metal Caps for Installing Expansion Joints in Concrete Pavement

By W. C. Brockway



METAL channel caps are being used to install premoulded expansion joint in concrete pavement in New England to improve construction at the joints and to facilitate installation of joint material. Caps consist of U-shaped sections in which the flanges extend down on both sides of the expansion joint. The installation involves the placing of the cap on the top of the joint material which is located so as to give a "flush joint." This permits the finishing machine to run continuously over the slab including the portion at and adjacent to the joint. Should the joint material and cap be slightly high, the screed may be lifted a trifle until the front edge has passed over the joint.

The older method of installation of joint continues to be used and consists of running the finishing machine to a point about 12 to 18 inches from the joint, where the screed is lifted and the machine run ahead until the joint is cleared. The screed is then set down and the finishing operation continued. The portion of the slab at and adjacent to the joint is finished by hand methods.

Satisfactory results can be obtained with either method, but it should be realized that good workmanship is of the utmost importance regardless of method. The general specifications of the New England states involving premoulded expansion joint are given in Table I. The usual 18- or 20-foot concrete roads are constructed one-half width at a time. Finishing machines are used except in Vermont where longitudinal hand finishing is required. When dowels are in-

involved they are pushed through the joint material.

CONNECTICUT PRACTICE

"Light Weight Caps" (about 16 gage, 0.0625 of an inch, with 1¼-inch sides or flanges) weakened by cutting slightly at third points to permit crowning, were used to some extent two years ago in Connecticut to

	Center Line					
Tangent	a b c d e					
Arc	f					
Chord	g					
Length of Arc	0	2'	4'	6'	8'	10'
Distance from Center Line	0	1'	2'	3'	4'	5'

TABLE II—TANGENT OFFSETS

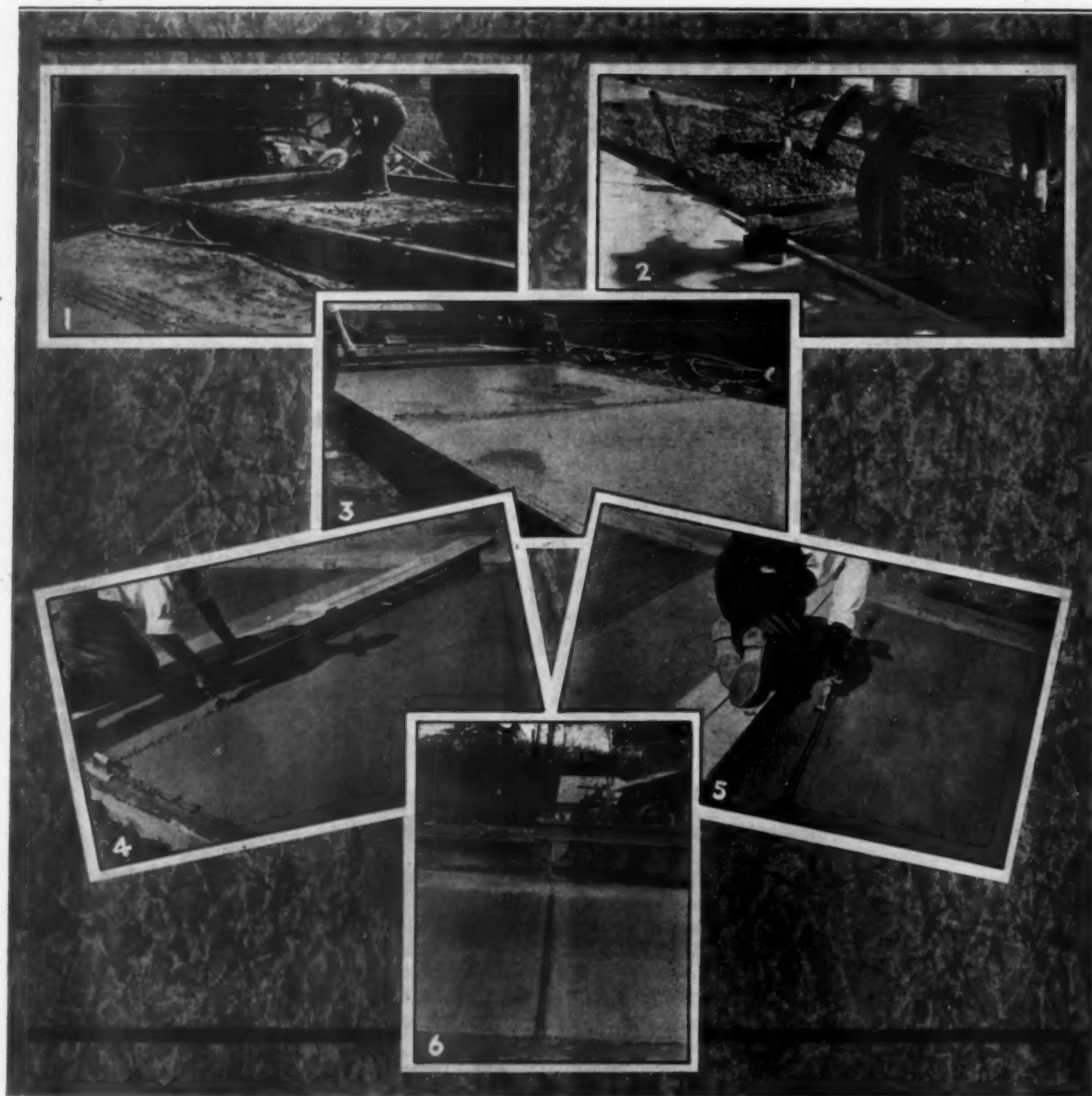
RADIUS	C. L.	a	b	c	d	e	For 20' Arc
Parabolic.....	0	1/32 In.	3/16 In.	3/8 In.	11/16 In.	7/8 (9 ft.)
240 Ft.....	0	1/32	3/32	7/32	14/32	5/8	2 1/2 In.
300 Ft.....	0	1/32	1/16	5/32	11/32	1/2	2
353 Ft.....	0	1/32	1/16	1/8	1/4	13/32	1 3/4
400 Ft.....	0	1/32	1/16	1/8	1/4	3/8	1 1/2
432 Ft.....	0	1/32	1/16	1/8	1/4	3/8

get straight alignment of the joints at the surface of the pavement and thus to overcome "wavy joints." Under Connecticut conditions, "light weight caps" were not satisfactory because they lacked strength and sturdiness. Accordingly, experimental work was conducted to overcome the difficulties with the result that the cap design shown in Table I is now standard for work in Connecticut. The design required by the State of Vermont is also shown and this year Massachusetts permits channel caps of 10-gage (0.141 of an inch) stock.

The Connecticut cap is U-shaped to fit ½-inch joint

TABLE I—EXPANSION JOINT SPECIFICATIONS—NEW ENGLAND STATE HIGHWAY DEPARTMENTS
(Details change frequently, these data correct early in 1928)

TRANSVERSE JOINT (Premoulded)	CONNECTICUT	MAINE	MASSACHUSETTS	NEW HAMPSHIRE	RHODE ISLAND	VERMONT
Interval (maximum)	60 Ft.	40 Ft.	60 Ft.	50 Ft.	100 Ft.	44 Ft.
Width of material (plus or minus slab thickness)	½ In. Plus	1 In. Plus	1 In. plus or with cap same width as slab thickness, crowned	½ In. or more plus	1 In. plus	½ In. less
Length	10 Ft. usual	9 or 10 Ft.	10 Ft.	9 or 10 Ft.	10 Ft.	9 or 10 Ft.
Thickness	½ In.	½ In.	½ In.	¾-¾ In. (use ½ In.)	¾ In.	½ In.
Cut Material	To conform to the required cross slope, plus ½ In.	To conform to the cross section of the pavement	See above item	To conform to the cross section of the pavement plus ½ In. or more	To the curvature specified for the crown of the pavement (both edges) plus 1 In.	To conform to the cross section of the pavement less the ½ In.
Cap	Required 10 gage 1½ In. and 3 In. Scant ¾ In. 400 Ft. circular	Permitted but not required Details not specified Varies	Permitted 10 gage Not stated 240 Ft. circular-radius	Permitted but not required	Not required (actually not permitted) Flat pitch and 403.29 Ft. & 300 Ft. circular radii	Required 14 gage 3 In. ¾ In. Flat pitch
LONGITUDINAL JOINT (premoulded) Thickness	¾ In.	Not required	Not required	Not required	¾ In. required on outside slabs of 40 Ft. roads	Not required



METAL CAP METHOD OF INSTALLING PREMOULDED EXPANSION JOINT IN CONNECTICUT

1. Cap, Elastite and stakes in position before placing concrete, showing the accurate crown of the cap. 2. Placing concrete at the joint. 3. Finishing machine run over the cap and joint. 4. After the final finishing machine operation the concrete is loosened along the flanges of the cap with a trowel to permit the easy removal of the cap and to prevent disturbing the concrete. 5. Edging the joint. 6. Finished joint sealed with asphalt. Perfect alignment as a result of the use of the channel cap and good workmanship. Photographs of Windsor Locks, Durham and Enfield Jobs in Connecticut.

material and consists of 10-gage (0.141 of an inch) stock, one side $1\frac{1}{2}$ inches and the other 3 inches, with an inside clearance of a scant $\frac{3}{4}$ inch, and is crowned. The heavy stock is used to insure adequate strength and practice seems to have demonstrated that this cap is strong enough to withstand the abuse it receives for such work. Having sides $1\frac{1}{2}$ and 3 inches makes it easier to place the joint material in the cap than would be the case if both sides were of the same dimension. Scant $\frac{3}{4}$ -inch clearance seems to be necessary for $\frac{1}{2}$ -inch joint for quick placing of the joint material in the cap. The same design except that both sides are three inches is used by the Lane Construction Corp.

when permissible. The technic of installation is shown in the first group of pictures of the Windsor Locks and the Durham projects in Connecticut.

VERMONT PRACTICE

The Vermont design involves 14-gage (0.078 of an inch) stock with both sides 3 inches and inside clearance $\frac{5}{8}$ -inch. Longitudinal hand finishing permits the use of lighter metal particularly with 3-inch sides. Incidentally, Vermont specifies joint material $\frac{1}{2}$ -inch less in width than the depth of the slab, the joint to be submerged that much and later poured with asphalt. The technic of installation is shown in the sec-

and group of pictures shown on this page.

ADVANTAGES OF INSTALLATION BY CAP METHOD

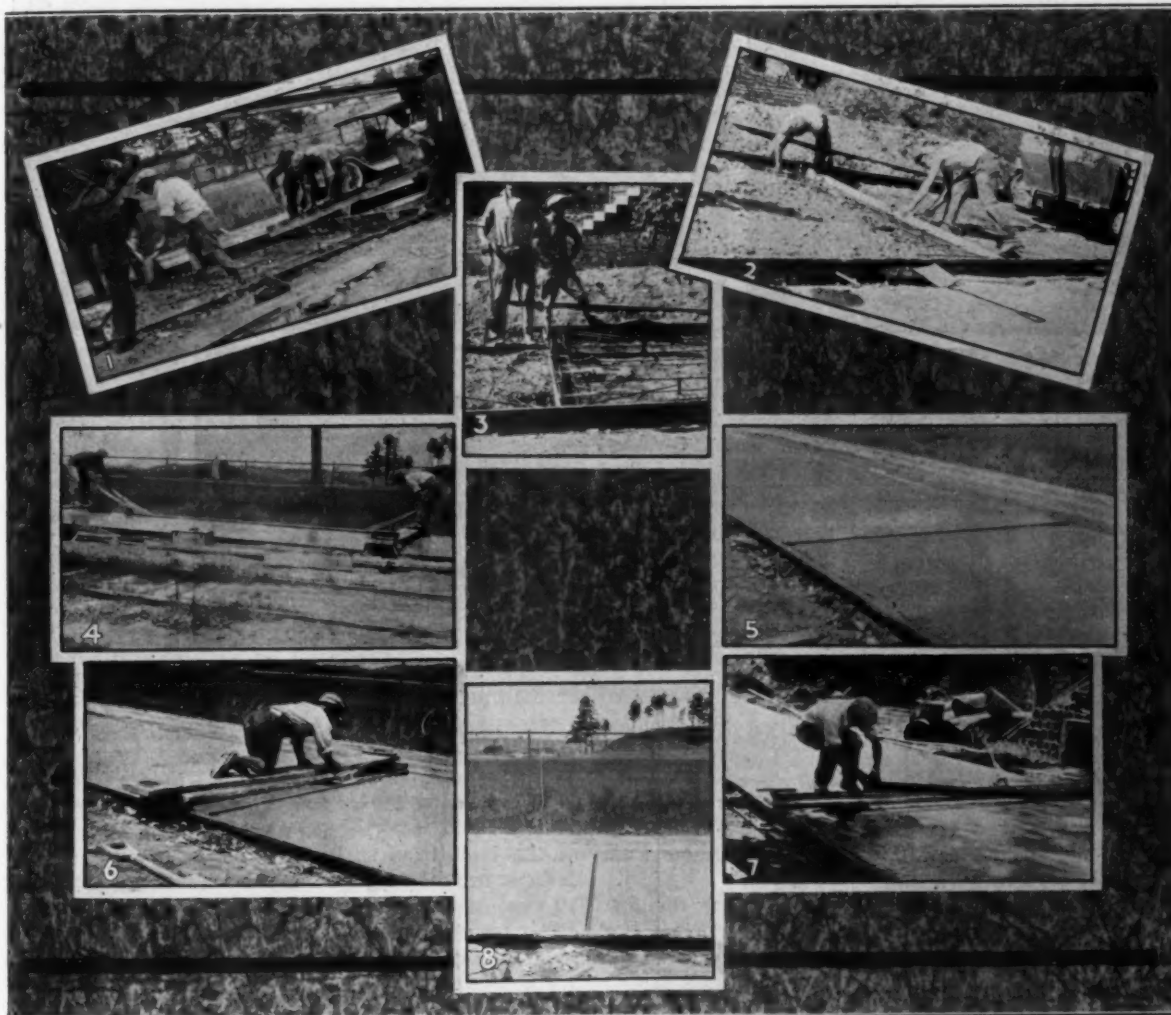
Continued and increasing use of caps demonstrates that they are proving to be satisfactory. The appearance of joints is much improved, for the surface alignment is straight and pleasing to the eye, and "wavy joints" are prevented. The operation of the finishing machine is facilitated, for it may be run continuously over the joint. Further economy results, since joint material may be used the same width as the depth of the pavement, while other methods usually required that joint material be as much as 1 inch greater in width than the slab depth.

The use of caps places no limitations on any particular method of installation of joint; it is an added refinement that can be used with or without a bulk-

head, with joint material the same width as or as much as 1 inch greater than the slab thickness, or in other words, it may be used with submerged, flush or projecting joints. Some prefer to use the cap with the bulkhead and some use the cap alone, because it is a simpler operation.

When both cap and bulkhead are used together some minor trouble may be caused by aggregate getting between the cap and the bulkhead. The bulkhead furnishes additional support, however.

The cap may be left in position until the concrete has set sufficiently to edge the joint, in which case it furnishes a straight edge for the finishers to work to, insuring straight alignment and making the work easier and more quickly accomplished. The slot, however, is wide. This method requires more caps than the method involving immediate removal of the cap.



INSTALLING EXPANSION JOINT WITH A METAL CHANNEL CAP IN VERMONT

1. The cap is on the piece of Elastite being placed and the steel bulkhead is already in position. The dowels are being pushed through the joint material. 2. Cap, joint material, bulkhead and dowels given final adjustment before placing concrete. 3. Concrete being placed. 4. Slab finished and floated over the joint. Longitudinal floating used in Vermont. 5. Cap raised above the surface of the concrete after finishing and before joint is edged. 6. Finishing and edging along the joint before the final removal of the cap. 7. Removal of the cap. This shows a widened curve where the standard length cap was too short. The extra width may be made up by using an extra cap for the required length in connection with the usual cap. 8. Finished joint with perfect alignment. Photographs of Essex Junction and West Rutland Jobs in Vermont.

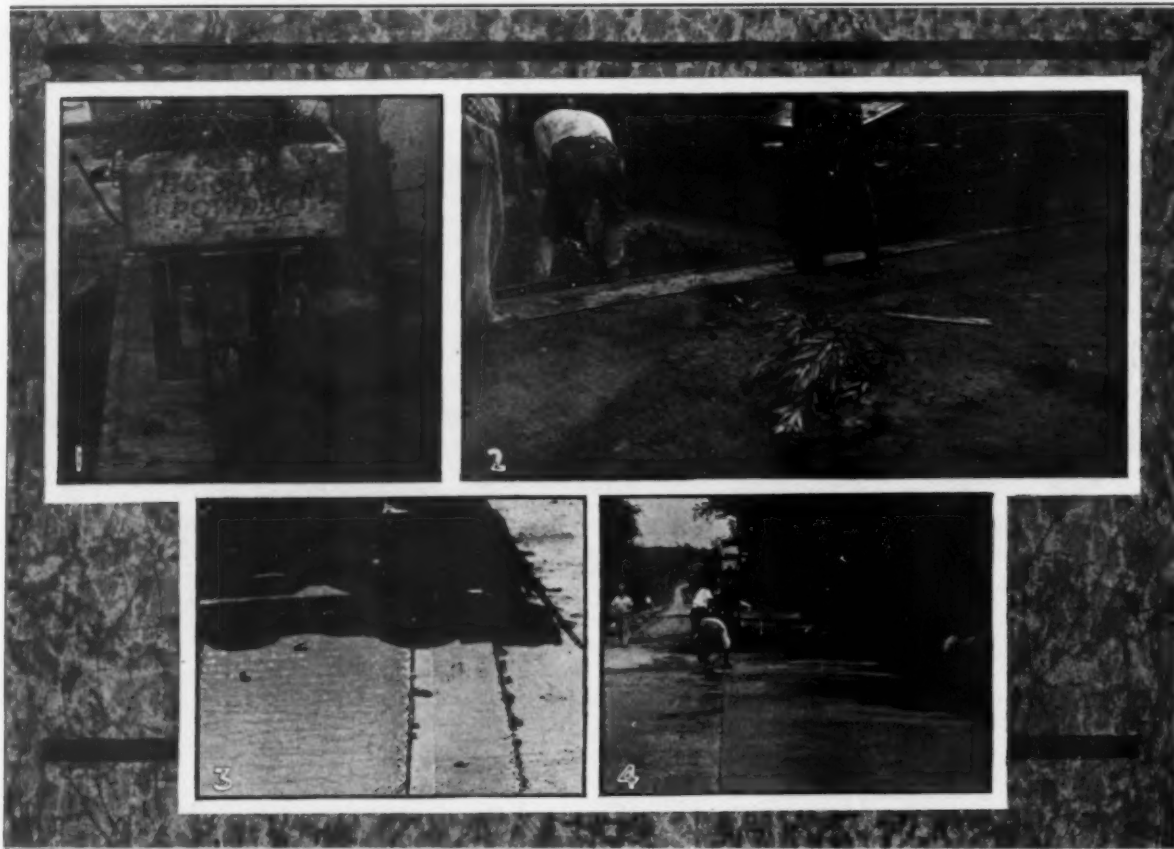
When removed immediately like a bulkhead, the slot is much narrower for fresh concrete and fills the voids left by the cap, but the finishers do not have the advantages of a straight edge to work to and the alignment is not quite so good although the joint is essentially satisfactory. A minimum number of caps are required for a job.

On one project in Connecticut the Bridgeport Construction Co. placed $\frac{1}{2}$ -inch wood strips over the top of the joint material immediately after the cap had been removed. The lower edges of the strips were concave to fit the crown. This scheme reduced the width of

are made as much as 2 inches short of the width of the slab.

If the pavement has a circular or parabolic crown, the joint is given this crown. To maintain and protect the crown in the joint material, the material may be kept in crates and only a crate or two a day hauled to the mixer. Crates may be placed on the finisher or on a special platform on the mixer, where the material is conveniently reached by the workmen.

When the finished joint is slightly submerged, it may be necessary to pour the depression. If so, it should be done promptly in order to protect the edges



CAP METHOD OF INSTALLING LONGITUDINAL EXPANSION JOINTS IN CONNECTICUT

1 and 2. The Type L cap fits over the top of the longitudinal joint and rests on the old slab so that the wheels of the finisher run on it. 3 and 4. Longitudinal joints after the removal of the cap showing straight narrow slots and freedom of the old slab from fresh concrete that otherwise would be splashed on it. Photographs of Durham and Meriden jobs in Connecticut.

the slot and at the same time provided the finisher with a straight edge to work to.

If necessary, caps may be removed after the finishing machine has gone over the fresh concrete the first time. To do this, however, would likely be somewhat of a nuisance.

Holes, $\frac{1}{4}$ -inch in diameter, are bored in the sides of the caps, 3 feet from each end. Nails pushed through these holes into the joint material hold the material in the cap. This is a convenience in handling and placing the joint and cap. After the concrete is in place and before the removal of the cap, the finishers remove the nails. After crews become accustomed to the use of caps, the nails are seldom used.

To clear the wheels of the finishing machine the caps

of the joint from spalling.

Caps can be made of any stock not heavier than 10 gage (0.141 of an inch), with sides of any length, either equal or unequal, with any clearance more than $\frac{3}{8}$ of an inch, of any length and with any crown. Caps are accurately crowned without destroying their alignment or any of their structural strength. Crown data are given in Table II.

LONGITUDINAL CAPS

The Connecticut Highway Department used $\frac{1}{4}$ -inch expansion joint for longitudinal joints, the joint material being the same width as the slab thickness. The joint is installed when the second slab is poured by placing and holding it against the old slab.

The Rhode Island Department also is using $\frac{1}{4}$ -inch expansion joint for longitudinal joint on some of the 1928 work.

To facilitate installation, several different metal caps have been tried in Connecticut. The channel type of cap was found to have certain limitations for longitudinal joints. The angle shaped cap seems to offer better possibilities, so most of the experiments have been made with it. One side of the cap holds the joint in position, the other side goes over the top of the joint material and on to the old slab so that the wheel of the finishing machine runs on it.

Type "L" or a similar design has been used mostly, although Type "M" is believed to have several advantages over the "L" but as yet has not been tried. The top side of the cap should be wider than the "swing" of the screed on the finishing machine. To facilitate handling the cap $1\frac{1}{2}$ -inch holes are bored in each end, permitting a bale hook to be used in picking it up. The corners are cut off to prevent the screed from catching and pushing the cap out of place. To secure a snug fit to the crown of the road, the angle is made slightly less than the 90 degrees. Twelve-gage stock is generally used.

Type "M" would provide two instead of one angle. This would strengthen the cap, make it reversible so that any bends or deformities caused by the wheel could be removed automatically by reversing the cap. Otherwise they would have to be removed by less convenient means. Also the second angle is additional protection against fresh concrete being spilled on the old slab.

ADVANTAGES OF LONGITUDINAL CAPS

The installation of longitudinal joint is facilitated, time is saved both in installation and edging the joint; joint material is held in place better by longitudinal caps than by methods improvised on the job. A uniform, straight, narrow slot is obtained that is superior to that obtained by usual methods of installation. The aggregate is prevented from getting between the joint material and the old slab.

Fresh concrete is prevented from spilling over on to the old slab thus saving the contractor the labor of scraping and removing such material from the surface of the concrete slab previously laid.

The second slab, which is usually slightly low due possibly to vibration of the finishing machine, shrinkage and settlement, is raised so that both slabs are more nearly of the same elevation.

Past experience indicates that longitudinal caps are not adaptable for use on curves for the slab would be raised too much and in general would not work out satisfactorily. On the North Haven, Conn. project, however, 5-foot caps are now being successfully used on curves.

CONCLUSIONS

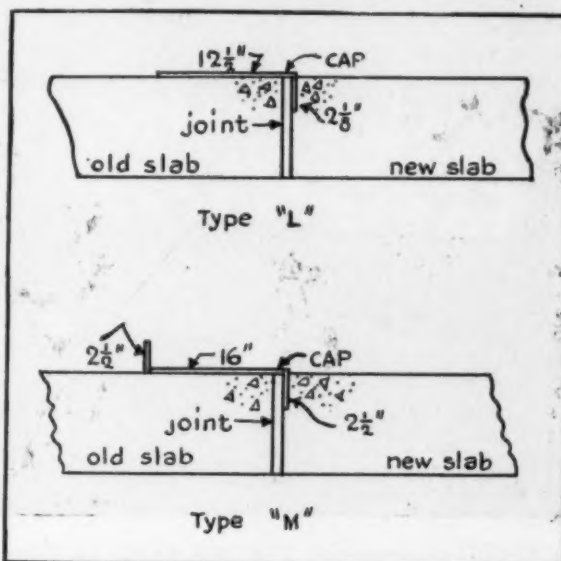
For several years the State of Connecticut has been using longitudinal joint with favorable results. On some work in the State of Rhode Island this year, longitudinal joint is being used to avoid certain conditions incident to previous practice, which did not include the use of premoulded longitudinal joint.

Apparently the use of premoulded longitudinal joint results in better separation of slabs and better edging

of the slabs at the joint, makes conditions less favorable for spalling at the joint and provides an expansion joint when this is necessary.

At present the status of the longitudinal cap is experimental only. Some engineers and superintendents like the cap and others do not. It is certain, nevertheless, that the longitudinal cap possesses considerable possibilities which will ultimately be realized.

The use of metal channel caps for transverse premoulded joints has resulted in better construction at



Cross Section of Concrete Pavement Showing Longitudinal Expansion joint and the Type L and Type M Longitudinal Caps.

the joints and has facilitated the installation of joint material. Caps are proving satisfactory for Connecticut, Vermont and Massachusetts conditions. They have been used to a very limited extent in New Hampshire, but with success.

It is not recommended necessarily as a superior method of installation for all conditions. The question of adoption should be a matter of study, though caps have several distinctive advantages that are pretty well established. It should be remembered that good joints are being installed by various methods when good workmanship is employed, that good workmanship is of prime importance, regardless of method.

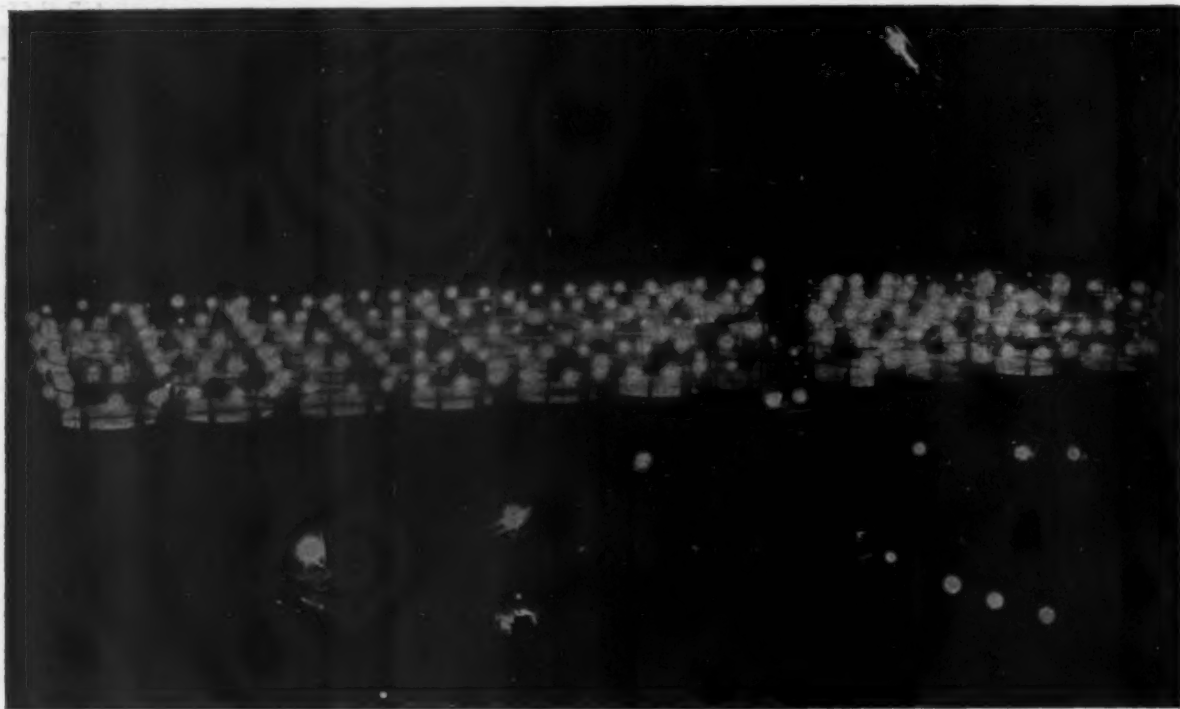
New Concrete Arch Bridge Contract Awarded

THE Washington Bridge Commission, Providence, R. I., has awarded the contract for the construction of a new concrete arch bridge over the Seekonk River at Washington Street, Providence, to the Merritt-Chapman & Scott Corp., New York, on their bid of \$2,984,000.

This new structure which connects Providence and East Providence will replace the old steel bridge which has stood at this point since the early 80's. The bridge is 2,408 feet long, 80 feet wide, providing a 60-foot roadway and two 10-foot sidewalks. There will be a double trolley track as on the old bridge.

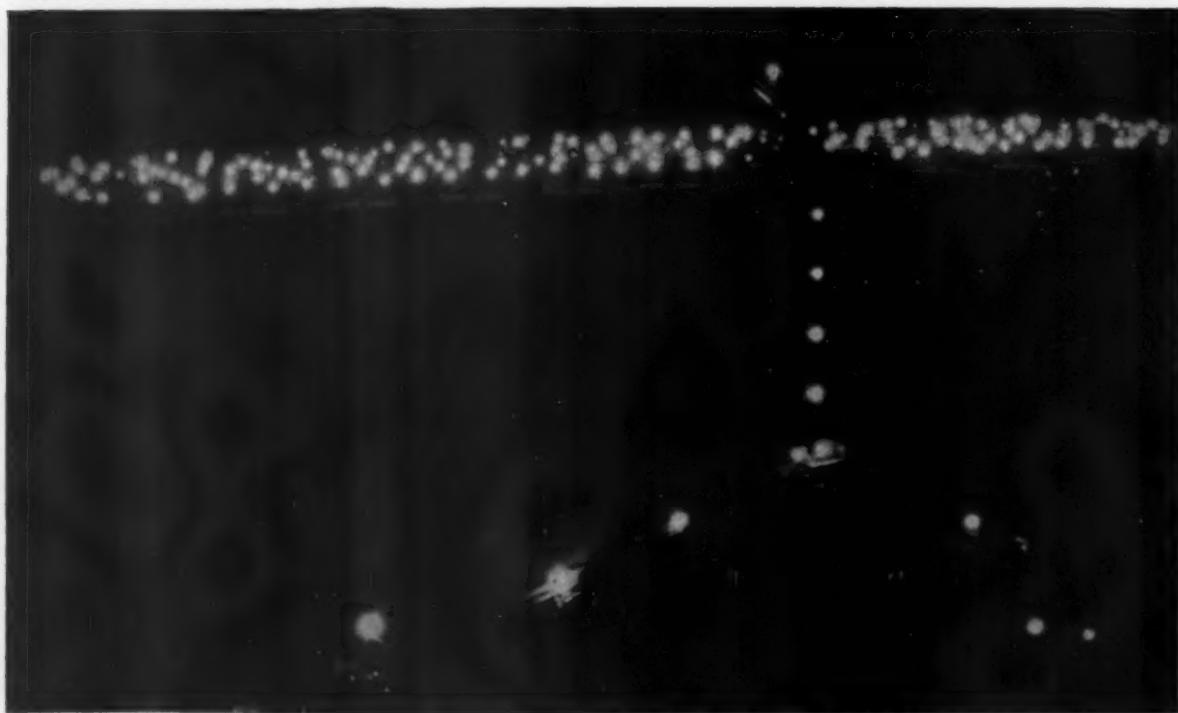
The bridge was designed by Clarence W. Hudson of New York and has twelve arches and a 150-foot steel bascule lift over the river channel. The paving will be of granite.

Night Work on a Grain Elevator



SPEED was essential. The Quaker Oats Co. simply had to have this mammoth 48-tank grain elevator to take care of unexpected crops. They strung up four hundred 75-watt lamps over the working area, besides about thirty more around the mixer and cement house,

and they started pouring cement twenty-four hours a day. The lights were lifted bodily as the job went up. Eighteen and a half days later it was done. The size of the undertaking can be gaged from the fact that the tanks are each 98 feet high, 25 feet in diameter.



Illustrations courtesy of "Light"

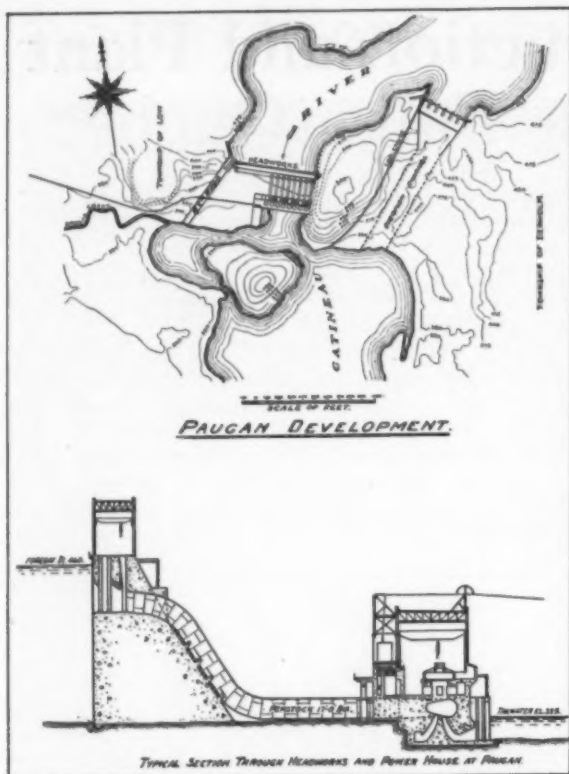


Figure 2. The Paugan Development and a Typical Section Through the Headworks and Power House

rate mixing and crushing plant would have to be installed at the sluice dam or a convenient method of transporting concrete across the river must be installed. An aerial tramway was decided upon as a solution to this problem.

CRUSHER PLANT

In accordance with these four essentials, the construction plant was laid out as shown in Figure 3. Figure 4 shows a general layout of the crusher and mixer plant.

Rock from the excavation is hauled up to the crusher plant in 6-cubic yard dump cars and is dumped into the hopper, A. This hopper feeds a 36 x 42-inch Buchanan jaw crusher, B, manufactured specially for hydro-electric construction, the frame being built in segments in order to facilitate its transportation, which is usually to locations difficult of access. The heaviest section is 7 tons compared with 40-ton sections in a crusher of solid frame construction.

The crushed rock falls on to a 30-inch belt conveyor, C, which conveys it to a screen, D. The rock from the jaw crusher struck the belt with such force that it caused excessive wear, and it was found necessary to replace the one continuous rubber covered belt, by a 2-belt system as shown dotted in Figure 4. A short 36-inch rubber covered belt, E, armored with $\frac{1}{2}$ x $1\frac{1}{2}$ x 10-inch steel plates, now conveys the rock from the jaw crusher to a second 30-inch belt, F, which in turn conveys the rock to the screen. The armor on the belt, F, successfully protects the belt from the shock of the falling rock.

The screen mentioned above was constructed on the job by the contractor's mechanics, and is of the shaker screen type. The oscillations are produced by S. K. F. roller bearing eccentrics, and the screen plate is cast manganese steel $\frac{5}{8}$ -inch thick, with 3-inch diameter holes on 5-inch centers. The screenings by-pass the gyratory crushers and go direct to the mine skip storage hopper, G, thus lightening the work of the gyratories. The rejects pass on to the gyratories: a No. 4 Austin, H; a No. 6 Austin, I; and a No. $7\frac{1}{2}$ Tel-smith, J. These three crushers, in conjunction with the screen, have sufficient capacity for the maximum output of the Buchanan jaw crusher. A maximum of 1,300 cubic yards was crushed during a 20-hour day,

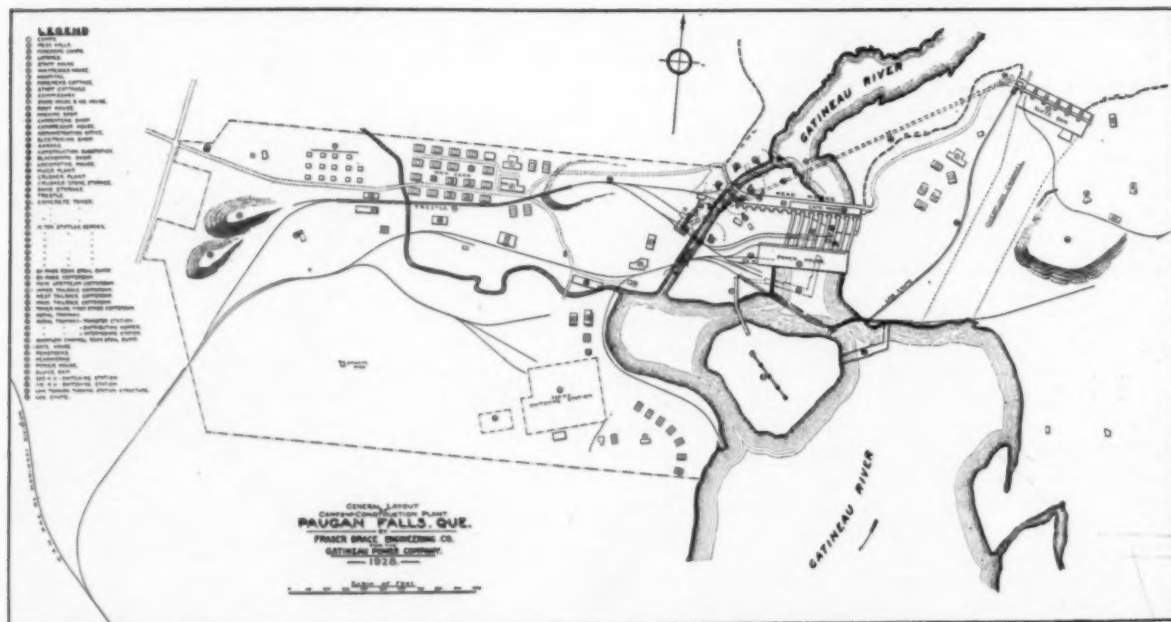


Figure 3. Layout of the Camp and Construction Plant at the Paugan Falls Hydro Electric Development

the output being limited by the rate of feeding, which in turn was governed by the delivery of rock; the large size of the rock also hampered the feeding. The primary object in taking out the rock was to excavate as large a daily quantity as possible from the by-pass or power house, so that the feeding of the crusher being a secondary objective there was not as much care taken to send suitable sized rock to the crushers as would have been the case had a quarry been used.

The rock emerges from the gyratories as 3½-inch crushed stone, which is suitable for the bulk concrete poured, and enters the mine skip storage hopper, G, of 50-cubic yards capacity. Two 70-cubic foot mine skips, K, hoist the crushed rock into the material bins.

the storage pile by a No. 31 Marion revolving shovel, loaded into 6-cubic yard cars, hauled to the mixer plant and dumped into the stone bins, L.

When the concreting commenced the crushed rock was discharged from the hopper, N, directly into the rock storage bins, L, in the mixer plant. This will be discussed at greater length in a succeeding paragraph.

The entire crusher plant was operated by a 500 h. p. slip ring motor, O, belt-connected to a 4 7/16-inch diameter main drive shaft, P. This drive is clearly indicated in Figure 4 which shows pulleys on the main drive shaft belt-connected directly to the jaw crusher, and the three gyratories and through a clutch to the two conveyors, and the shaker screen. Only when,

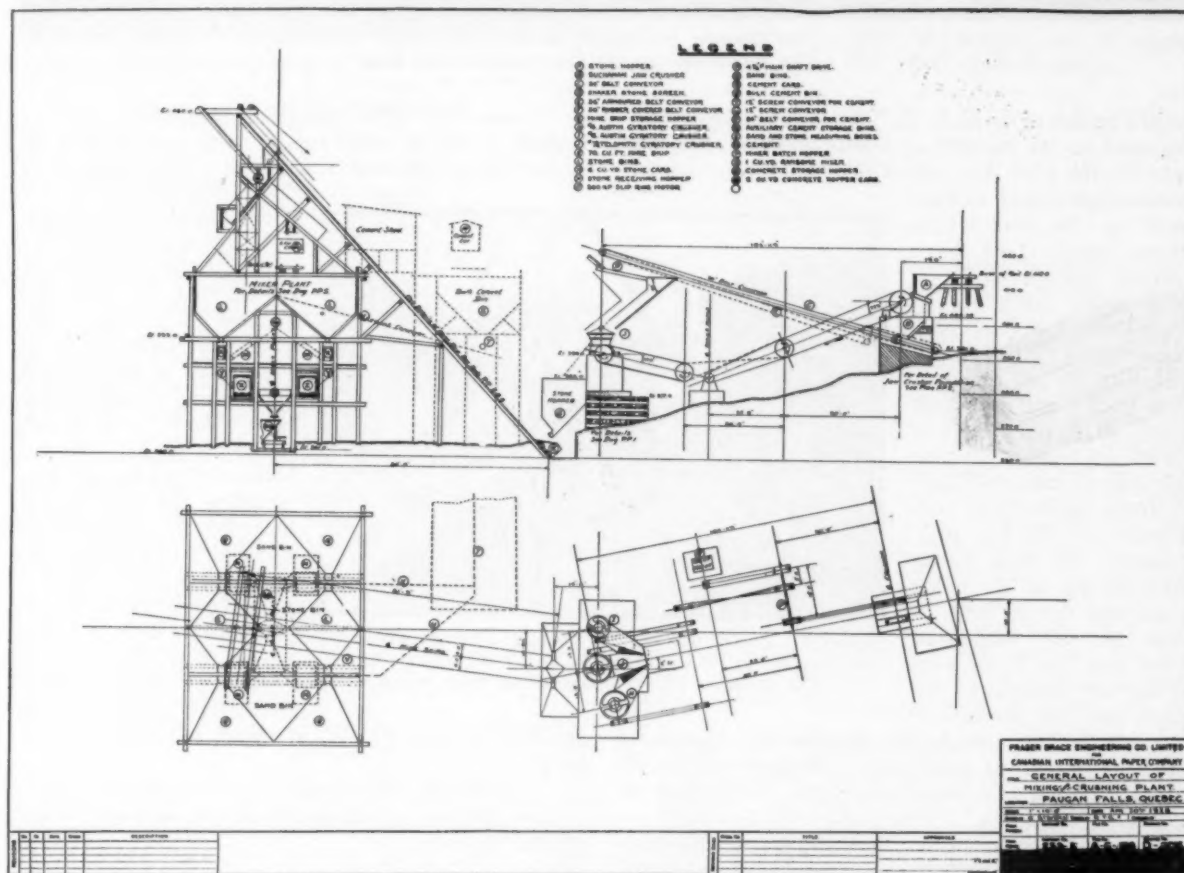


Figure 4. Elevation and Plan of the Mixing and Crushing Plant at Pagan Falls

L, or to cars, M, for the storage pile. The skips are operated by two Jencks cableway hoists, belt-connected to 75 h. p. motors.

The irregular topography of the land made it necessary to locate the storage pile approximately 500 yards from the crusher plant, where a suitable location was found. The mine skips dump the rock into a small receiving hopper, N, from which the 6-cubic yard cars, M, are loaded. These cars are hauled to the storage pile, shown on the plant layout drawing Figure 3 at 24 and dumped. By throwing the track on a slightly rising grade, a triangular shaped pile 30 feet high, holding approximately 60,000 cubic yards, was easily made, as the ground falls away from the apex of the triangle. Crushed rock was reclaimed from

for some reason or other, the plant was forced to shut down with all four crushers, the two conveyors and the screen loaded with rock was any difficulty experienced with this drive; in this case the starting load was too great and the crushers had to be partially unloaded.

MIXER PLANT

The method by which the crushed rock is produced and stored in the bins has been described in connection with the crusher plant.

The finding of suitable concrete sand presented a problem which was only solved by purchasing the Canadian-Pacific Railroad ballast pit at Diotte, six miles from Pagan (towards Ottawa) on the Ottawa-Mani-



Figure 5. The Construction Camp Layout Showing the Trestle to the Mixer Plant, 26 on Figure 3, in the Center, the Camp Buildings on the Right of the Trestle and the Machine and Carpentry Shops on the Left of the Trestle

waki Division of the C. P. R. Two 15-ton stiffleg traveling derricks are installed at Diotte and clam the sand into 25 cubic yard Hart convertible ballast cars. Sand is hauled in trains of six cars each by the contractor's 45-ton saddle tank locomotives, with a C. P. R. pilot aboard while on the main line. A railroad spur connects the C. P. R. main line with the job construction tracks, and over this siding all supplies and materials are brought into the job from Ottawa and Hull. A trestle, indicated at 26 in Figure 3, 1,270 feet long, connects the main siding with the top of the mixer plant and cement bins, as well as the headworks. Over this trestle the sand trains are hauled to the plant and the contents of the cars dumped directly into the bins, Q. The top of the sand bins in the mixer plant is covered with a grillage to prevent any large stone from falling into the bins.

Cement is obtained from the Hull plant of the Cana-

da Cement Co. The cement is shipped in bulk to Paugan, in special grain cars, R, which are hauled up to the cement bin over the trestle. Here the bottom dump hopper at the car doors is opened, and the cement around the door discharges by gravity into the cement bin, S. The remainder of the car is unloaded by means of a $\frac{1}{4}$ -cubic yard slusher scraper operated by a single drum hoist. Four 12 x 12-inch radial cut-off gates on the bottom of the cement bins regulates the flow of cement into the 12-inch screw conveyor, T, running parallel to the bin. The two screw conveyors, T and U, feed two 24-inch belt conveyors, V, which carry the cement, at right angles to the mixer plant, into an auxiliary storage bin, W, of about 100 bags capacity each.

STORAGE FOR AGGREGATE AND CEMENT

The capacities of the aggregate bins and the cement storage bins are:



Figure 6. Bypass Excavation Showing Derricks 31 to 37 Indicated in Fig. 3 Excavating Rock in the Bypass Channel. The Gatineau River Is Seen in the Background

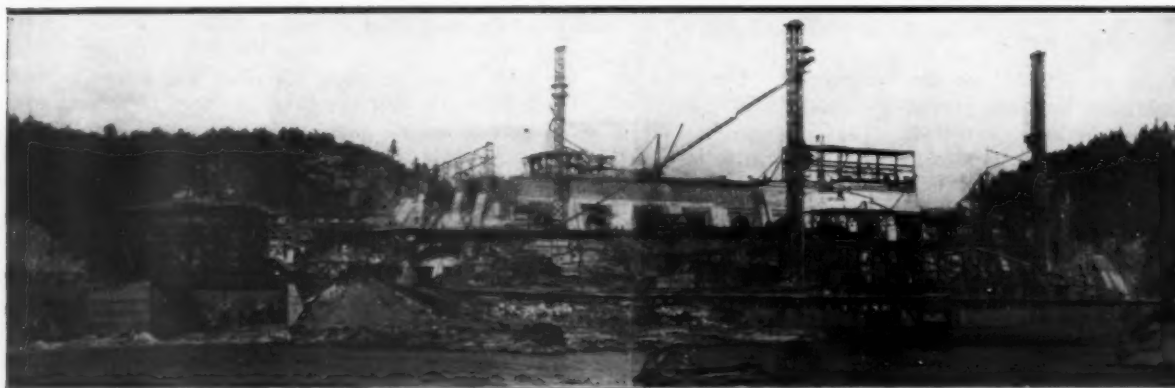


Figure 7. A General View of the Power House and Headworks During Construction Showing the Mixer Plant and Bypass at the Left and the Power House and Tailrace Cofferdam to the Right



Figure 8. Upstream Cofferdam at 40 in Fig. 3, Unwatered, Showing Ledge Over Which the Gatineau River Previously Flowed to Form the Paugan Falls

Crushed stone bins, L.....	600 cubic yards
Sand bins, Q.....	400 cubic yards
Bulk cement bins, S.....	6,000 bags

The capacities of the bins are ample to insure uninterrupted production of concrete, except for delays of greater duration than five hours in the supply of aggregate, or ten hours in the supply of cement, all based on an average production of 2,000 cubic yards in a 20-hour working day. This average was easily maintained, a maximum 24-hour record of 3,100 cubic yards established, and a monthly maximum of 63,309 cubic yards was poured in August, 1927.

PROPORTIONING EQUIPMENT FOR CONCRETE

Stone and sand measuring boxes, X, are suspended directly over the mixer batch hopper, Y. The measuring boxes are equipped with counterweighted self-closing bottom gates, and are filled up to marks set by the engineers to correspond to the proper quantities of sand and stone, determined by tests.

Water is measured in a barrel alongside the operator, who is able to control the amount of water used to conform to the stipulated quantity.

Cement is volumetrically measured in rectangular measuring boxes, XX, constructed with plate glass sides, upon which the proper quantity is calibrated for the different mixes. While a batch is turning over in the mixer the operator measures off the proper quantities. Upon discharging a mixer he is able to empty the contents of the measuring boxes, by tripping the gate levers, into the mixer batch hopper in 15 seconds, thus insuring a minimum of a full minute's mix during the maximum rate of mixing of 40 batches per hour, or 1½ minutes per batch.

The mixers used, Z, are four 1-cubic yard Ransome mixers, belt-connected to 30 h. p. motors. The mixers are located at the four corners of a concrete hopper, AA, of 16-cubic yard capacity, and discharge their mix into this central hopper, from which the concrete is drawn off into 2-cubic yard concrete hoppers, BB, mounted in pairs on standard gage trucks.

CONCRETE PLACING EQUIPMENT

The concrete hopper cars are hauled by gas locomotives on a standard gage track which runs through the center of the mixer plant directly under the con-

crete hopper, AA. The concrete cars are transported to hoppers located at the foot of each of three concrete towers 27, 28 and 29, Figure 3. Three 4-ton Vulcan gas locomotives are employed to haul concrete.

The entire 200,000 cubic yards of concrete in the west portion of the job were placed by this method. The concrete tower layout is indicated in Figure 3.

Towers 27, 28 and 29 are the main distributing towers, and tower 30 is a relay tower for the western section of the headworks concrete, which was inaccessible from the concrete track.

The towers are constructed of 10 x 10-inch B. C. fir timber posts and 3 x 8-inch bracing. Each tower's equipment consists of:

- 1—2-cubic yard Lakewood concrete tower bucket
- 1—2-cubic yard Lakewood receiving hopper
- 1—50-foot Lakewood steel boom chute section
- 1—50-foot Lakewood steel counterweight chute section
- 300- to 500-foot Lakewood continuous line chutes

The concrete buckets are hoisted by single drum cableway hoists, belt-connected to 125 h. p. motors.

CONCRETE PLACING EQUIPMENT FOR OVERFLOW CHANNEL

Concrete is transported direct from the central hopper, AA, in the mixer plant to a distributing hopper, 47 in Figure 3, on the east channel overflow section in ¼-cubic yard buckets traveling on an aerial tramway, 45. This aerial tramway was purchased from the American Wire Rope Co. at Worcester, Mass. The carrying cable was a 1¾-inch locked coil track cable, and the hauling rope a 9/16-inch Lang lay crucible steel cable. The motive power was supplied by a 25 h. p. slip ring motor. A transfer station was situated in the headworks at 46, and the tramway spanned the Gatineau in an 850-foot span to an intermediate station, 48, on the east bank, from where it ran to the terminal station, 47, at the sluice dam, as shown in Figure 3. Form lumber, camp supplies, coal, etc., were also transported to the east channel over this tramway. The remainder of the construction plant employed in proceeding with the work to a successful conclusion will be

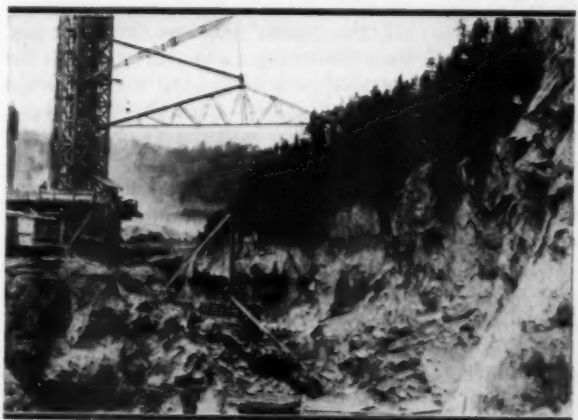


Figure 9. The Artificial Gorge of the Gatineau River After Unwatering Showing Towers 28 and 29 Indicated in Fig. 3 to the Left and Upstream Cofferdam. The Concrete Bucket on the Aerial Tramway Traversing the Gatineau River as Seen in the Background. The Rock in the Right Foreground was Shattered from the Cliff by the Velocity of the Water Flowing Through the Gorge

discussed in connection with the following chronology.

CAMPS AND ADMINISTRATION BUILDINGS

Construction was commenced in September, 1926, by the building of camps, dwellings, and administration buildings. This construction is shown in the general layout of camps and construction plant in Figure 3 and also in the photograph Figure 5. The camps consisted of 23 camp buildings accommodating 64 men each; 3 mess halls, each seating 336 men; 4 separate camps for foremen; latrines, a staff house, providing living quarters and dining room for the staff; foremen's cottages, waitresses house and hospital. Cottages for the senior members of the staff and their families were also erected and these are to serve as living quarters for the permanent operating staff.

In connection with the commissary department are a storehouse, van, barber shop, ice house and root house. The contractor operates the commissary, and the charge of \$1.00 per man per day, plus operating profits of the store, van, etc., covers operating expenses and the cost of camp equipment.

Administration buildings, also constructed during the fall of 1926, included administration office, machine and carpenter shop, compressor house, etc.

BY-PASS

Excavation of the by-pass rock was commenced in October, 1926, and was carried on by seven 15-ton stiffleg derricks, located as shown at 31 to 37 in Figure 3, and also depicted in the photograph in Figure 6. The excavated rock was disposed of on the spoil dump at 38, Figure 3. By February, 1927, the crusher plant was running, and rock excavated from the by-pass was sent direct to the crusher, and the crushed rock hauled out to the storage pile.

The by-pass coffer, 39, was built during January and February, 1927, and enabled the by-pass to be excavated to grade and the regulating sluice concrete to be commenced on March 16, 1927. The rock was excavated at the rate of approximately 600 cubic yards a day and completed by April 19, 1927. Concrete for the regulating sluices was brought up above water level by the end of May and the by-pass coffer was removed. On June 4, 1927, the temporary stop logs were removed, by blasting away the supporting struts, allowing the river to be diverted through the by-pass. Figure 7 gives a good idea of this stage of construction and shows clearly the mixer plant at the left, the by-pass with water flowing through it in the foreground, and the power house cofferdam to the right.

HEADWORKS

The headworks excavation was commenced during

the winter of 1926-27. Stiffleg derricks were employed on the excavation and the rock disposed along the upstream face of the dam, or loaded into cars and hauled to the crusher. The first concrete was poured during the first half of May, 1927, and concreting on the western portion of the headworks continued throughout the summer of 1927.

The eastern portion of the headworks in the river section was unwatered as follows:

Following the by-passing of the water in June, the upstream cofferdam, 40, Figure 3, was commenced. This cofferdam was built across the ledge of rock which previously formed the falls and is shown unwatered in Figures 8 and 9, which clearly illustrate the formation of the rock and characteristics of the river discussed in previous sections.

The downstream cofferdams, 41 and 42, Figure 3, were then constructed and pumping commenced about the middle of June. Excavation was carried out by derricks, Figure 9, on the river section of the head-

works and was completed by the end of August. Concreting commenced July 20, 1927, and continued uninterrupted, except for two weeks during the first half of August, until completed in November, 1927. The headworks concrete was practically all placed from towers 28 and 29, Figure 3. The interruption in August took place during the period the river was in flood, at which time the water was allowed to pass over the top of the cofferdam.

POWER HOUSE

Meanwhile the first stage power house cofferdam, 44, Figure 3, was completed and the west half of the power house excavation commenced on March 16, 1927, and was completed for the erection bay and the first two units by June 1. Concreting of this section commenced on May 25, 1927, as depicted in Figure 10. The excavation of the remainder for the six units was commenced in July, about the same time as the river section of the headworks, described in the previous paragraph. Concrete for the power house was placed from towers 28 and 29, and this operation continued uninterrupted from June until the end of October when the substructure concrete was completed.

OVERFLOW CHANNEL SECTION

Work on the eastern overflow channel section consisted of excavating a channel involving 126,000 cubic yards of rock excavation, and the construction of a sluice dam. This rock was excavated by a Marion-60 shovel and hauled to a disposal dump, 49, Figure 3, nearby. The cleaning up of the rock was done by stiffleg derricks and was completed by the end of September, 1927.

Concrete for the gate section in the sluice dam was transported across the river as previously mentioned,

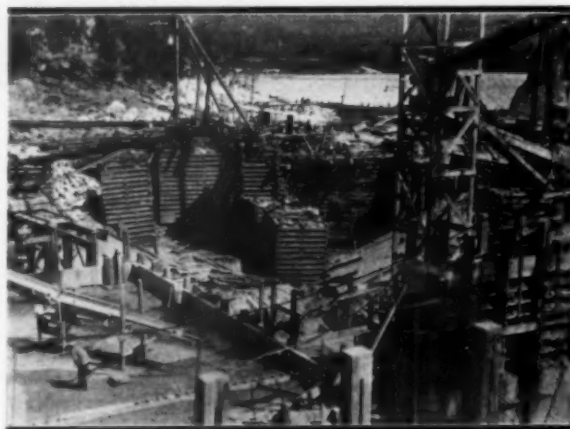


Figure 10. First Stage of Power House Cofferdam at 44 in Fig. 3 unwatered. The Depth of Water Was Approximately 50 Feet. Concrete Is Being Placed in the Erection Bay and First Two Units

by an aerial tramway and placed in the forms by chutes from a trestle, built across the upstream face of the gate section. This concreting was completed by October 18, 1927, and the erection of the sluice gates commenced. These were installed by the end of February, 1928, and are shown in operation in Figure 11.

SUPERSTRUCTURE

Headworks.—The gate house is 382 x 35 x 41 feet high and is of structural steel frame, brick encased, with concrete roof. Structural steel erection was completed on the western end of the headworks in September, 1927, and brickwork commenced immediately. As soon as the substructure on the eastern half was completed the structural steel and brickwork followed up so that the entire gate house was enclosed by the end of December and the installation of gates, trash racks and gate operating mechanism commenced. The installation of the gates continued throughout the winter so that by March 15, 1928, all "below water" construction and installation was complete, ready for closure.

Power House.—The power house superstructure is built to house eight units and is a structural steel frame building, brick encased with concrete roof having the following dimension: 484 x 57 x 60-feet high. The substructure of the first two units of the power house was completed by August, 1927, enabling steel erection to start by September 1. Brickwork was then started and the entire eight units were enclosed by December, 1927, and installation of the water wheels commenced on January 6, 1928.

PRINCIPAL CONSTRUCTION QUANTITIES

The construction program outlined in the preceding paragraphs involved the following total construction quantities:

Excavation	366,000 cubic yards rock
	70,000 cubic yards earth
Concrete	239,300 cubic yards
Cement	370,000 barrels
Brick	1,600 thousand

COMPRESSED AIR

Compressed air was supplied by nine compressors ranging in size from 175 to 1,265 cubic feet having a combined capacity of approximately 5,225 cubic feet of air per minute. The location of the main compressor house is shown at 15 in Figure 3.

CONSTRUCTION POWER

The job was started up by using steam power until

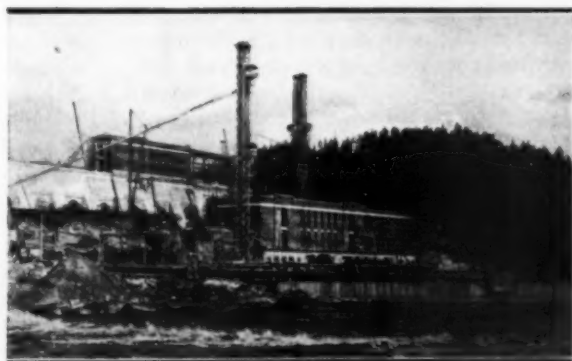


Figure 12. Power House and Gate House During Construction Showing Openings in the Headworks for Future Penstocks in the Upper Left Hand Corner

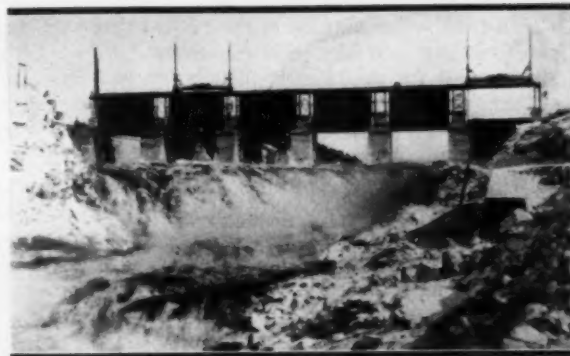


Figure 11. The Sluice Dam in the Overflow Channel Showing the Sluice Gates Raised and 16,000 Cubic Feet Per Second Flowing Through the New Channel on March 28, 1928

the transmission line was completed from the 1250 kw. Maniwaki plant of the Canadian International Paper Co. Frazil ice resulted in curtailment of this power supply so that a 11,000-volt wood pole transmission line was subsequently constructed from Chelsea to Paugan.

Three 500-kva, 3-phase, 60-cycle, 11,000-volt, 2200-volt transformers, located in the temporary substation 19, Figure 3, stepped the power down to 2200 volts at which voltage power was used in motors of 100 h. p. and over.

Transformers at various convenient locations throughout the job stepped the power down to 550 volts for use in motors under 100 h.p. Motors required to operate the construction plant had a total rated capacity of 4,000 h.p.

CLOSURE

By March, 1928, all "below water level" construction was completed enabling the by-pass regulating sluice gates to be closed, and the water to be raised 92 feet so as to flow through the discharge sluices of the overflow channel. This closure was effected in the following sequence:

On March 21, 1928, the regulating sluice gates at the Bitobee storage dam were closed to lessen the flow through the by-pass. The steel gates in the by-pass regulating sluices were lowered on March 23. The sill of these gates is at elevation 330.0 and the water elevation above the headworks before closure was 346.15. The water rose 85 feet to elevation 431.0 in three days. At this elevation water commenced to flow over the sill of the discharge sluices in the eastern or overflow channel. Figure 11 shows the entire flow of 16,000 C. F. S. passing through the discharge sluices on March 28, 1928.

This constituted the last step in diverting the Gatineau River from the western gorge at Paugan Falls to the overflow channel, and the by-pass openings were then concreted in. The new river is shown in Figure 11 flowing through the discharge sluices of the eastern channel with a mean water level 92 feet higher than the original level above the falls.

INSTALLATION OF EQUIPMENT

All efforts are now being concentrated on the installation of penstocks, water wheels, generators, transformers and switching equipment.

Penstocks.—Installation of the 17-foot diameter steel penstocks was commenced in September, 1927, and the six required for the present installation have been installed. Openings have been provided in the headworks for an ultimate installation of 14 penstocks: these may be seen clearly in Figure 12.

Water Wheels.—The turbines are of the Francis type of runner approximately 11-foot 2-inch diameter, the present installation consisting of six 34,000 h.p. units, two of which are installed, and work is progressing on the remaining four.

Generators.—The generators are rated at 28,500 kva., 85 per cent power factor, 3 phase, 25 cycle, 6,600 volts. The first two units are now turning over and the last is scheduled to be installed by September 1, 1928.

Switching Equipment.—The high tension switching equipment is located in an outdoor switching station and

provides facilities to step-up the current to 110,000 volts or 220,000 volts.

The 110,000 volt system is tied into the Chelsea and Farmers plants by a 110,000 volt, single tower, double circuit, steel tower transmission line.

All of the 272,000 h.p. developed, will be stepped up to 220,000 volts. The 220,000-volt system is tied into the Ontario Hydro Niagara distribution system by a 210-mile, 220,000-volt single-tower, single-circuit, steel tower line from Paugan to Toronto.

ADMINISTRATION

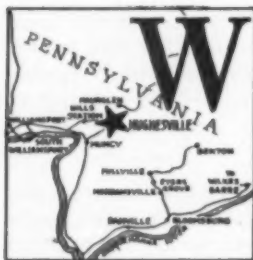
The Canadian International Paper Co., A. R. Graustein, President, and its subsidiary, the Gatineau Power Co., own and operate the Paugan Falls plant, as well as the entire Gatineau development. The three power plants and the paper mill were constructed by Fraser-Brace Engineering Co., Limited, of Montreal.

A Pennsylvania Concrete Road Job

Tyler & Cole, Inc., Meshoppen, Pa.

Complete 2.09 Mile Project

On Time Despite Rain



ET grounds—means no game, and it also means no profits for the contractor who does not take the possibility of rain into consideration in planning his work. On the 2.09-mile project between Hughesville and Halls Station, Pa., Tyler & Cole were considerably delayed because of the unusually wet May

and June. The project included grading, drainage and concrete paving and every bit of the work was done by the general contractor's own organization. By strenuous measures the contractor finished the work about on schedule.

One of the unusual problems met on this work was the abundance of stone drains belonging to the old farms in the district. In some cases these drains carried so much water that the stream gushed up a full two inches from the ground when they were opened by the shovel in grading operations. Another difficulty, which fortunately occurred but once, was the near loss of the services of the big road roller which became mired on one of the fills. "Big Betsy," as the Koehring gas shovel is called by all on the job, came to the rescue and pulled hard enough to permit the roller to come out under its own power. This was only one of the many instances of the utility of Big Betsy according to C. E. Howe, Superintendent for Tyler & Cole.

GRADING OPERATIONS

The line of the road, known as Route 355, follows generally the old highway but most of the work was on relocation to eliminate curves and reduce grades. Grading operations began September 19, 1927, and continued until December 8, when work was discontinued for the winter. In this time 80 per cent of the grading was

completed and one bridge put in; all underdrains and tile drains were also finished.

Spring operations started on April 15, 1928, and actual pouring of the concrete began May 24. Pouring was completed July 17 and the job finished July 27. This was made possible by following the policy of completing all headwalls and shoulders as work on the road slab progressed. The concrete was poured from the paver. Many contractors, eager to collect on the concrete, knowing that most of their money is tied up in that operation, leave the shoulders and even the headwalls for the final operation on the contract. This, of course, tends to lead to a slacking of the spirit of the job at the end, resulting in less effective work. By carrying on the shoulders with the slab, and also pouring the headwalls at the same time the slab is placed, interest is maintained in every operation.

CUT AND FILL

The cut on this job was about 12,500 yards and the fill 14,000 yards making it necessary to borrow about 1,500 yards from a nearby pit. The maximum haul for fill from cut or borrow was about one mile. The Koehring gas shovel handled all the cut loading into 2½- and 5-ton Autocars with dual pneumatics and Heil hydraulic hoists. The fill was spread by two men by hand assisted by a small patrol grader hauled by a team. An Austin 10-ton steam roller was used for compacting the fill.

CONCRETING

The concrete slab was the standard Pennsylvania specification, 1: 2: 3 mix, 9-7-9-inch slab with ¾-inch reinforcing bars on either side of the center steel and two bars at the outer edges of the slab. The 18-foot pavement was poured in one operation, using a Rex 21E paver.

Sand for the job was purchased from the Lycoming



Unloading Plant of Tyler & Cole, Harrisburg, Pa., at Hughesville Showing the Erie Crane Unloading Sand from Gondola Car to Stock Pile with Blaw-Knox Bins and Batchers Fully Stocked

Silica Sand Co., Montoursville, Pa., and delivered by rail to a siding at the Hughesville end of the job. The sand was unloaded by an Erie steam crane and clamshell with two men helping in the car cleaning up and spotting the Williams bucket in the cars. Stone came by rail from Lime Bluff, one mile from Hughesville, and was unloaded the same as the sand to a stock pile.

A Blaw-Knox 52-ton bin with measuring batchers handled the proportioning. It was served by the Erie steam crane and Williams clamshell. The Autocars carried 2 or 3 batches receiving 6 bags of Phoenix cement per batch as they pulled out from the proportioning plant. These were emptied on the batches when the trucks arrived at the mixer and before the batch was emptied into the mixer skip.

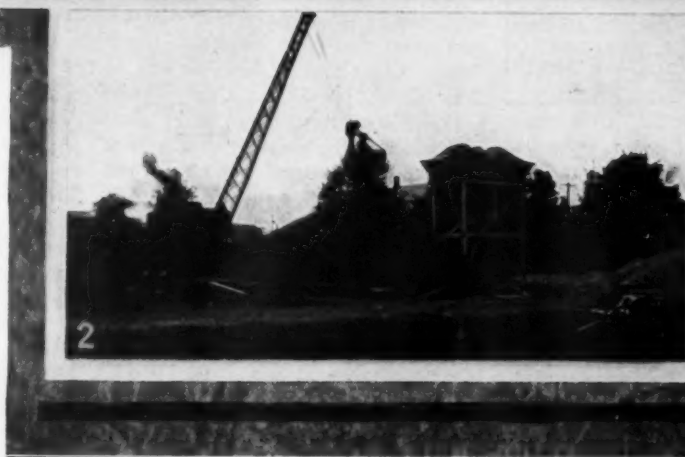
Form setting was handled by the grade foreman and 5 men. All final finishing of the subgrade was done by hand and the final rolling of the subgrade was done with an Austin 3-ton Pup roller.

Two men handled the cement on the trucks; there was 1 mixer man, 2 men spreading the mixed batches, 2 men spading at the forms, 2 men spading and spreading in front of the Ord finishing machine, one man running the finisher, 2 men spreading the burlap, and 1 man to prepare the 2 per cent solution of calcium chloride for the mixing water. Two men hand-floated the surface just long enough to prevent the formation of any waves in the surface.

Pouring began at the Halls Station end of the job and continued through to Hughesville broken only by spells of very heavy rain which prevented pouring or made the subgrade so wet that hauling was out of the question.

PERSONNEL

This work was carried on under the Pennsylvania State Department of Highways with J. S. Ritchey as Division Engineer, and Roger Crosetto as Chief Inspec-



tor. C. E. Howe was Superintendent for Tyler & Cole, Inc.

Watch Your Step When Bidding

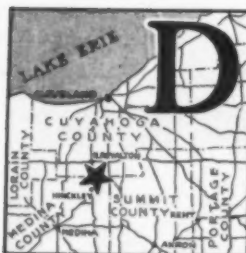
AN interesting item recently appeared in the *Nerba* which again illustrates the need of very careful reading of the specifications on the part of contractors when preparing their proposals. Among the special provisions applying to the Lexington, Mass., highway project for which bids were opened on June 19 under the paragraph head, "Type of surface" was a provision that "the bituminous material shall consist of fluxed native lake asphalt." That provision called for Bermudez or Trinidad asphalt usually bid at about 20 cents per gallon, against 12 to 14 cents per gallon ordinarily bid for the asphalt generally used.

At the opening of bids, it developed that six bidders submitted prices ranging from 12 to 14 cents on the bituminous material item and four bidders put in prices ranging from 20 to 22 cents for that item. It is apparent that those contractors who bid the range of prices from 12 to 14 cents did not carefully read and consider the special provisions and, as the item called for 60,600 gallons they put in bids about \$5,000 lower than they would have done had they fully realized what the specifications called for with reference to bituminous material. This was on a contract carrying an engineer's estimate of \$44,666.46.

Haste, pure carelessness or a feeling that he can "get away with it" are the reasons for such discrepancies as mentioned above. There may be some excuse for errors caused solely by haste due to certain conditions but for carelessness and chance-taking there is only condemnation.

Rapid Progress Made on 2.75-Mile Brick Road

*Well-equipped Organization Laid Concrete Base
and Small, Fast Brick-Laying Gang
Finished Quickly*



DESPITE hauling conditions that made approach to the work a difficult matter and necessitated the use of a Cletrac 40 to pull trucks through fields and up steep grades on back roads remarkable progress was made by Baldwin Bros., Cleveland, Ohio, on their I. C. H. 553 contract between Royalton, Ohio, and Boston Road. The contract involved the pouring of a 20-foot foundation course of 1:7 concrete with a thickened edge. The 9-inch slab was thickened at the edges to 12 inches and had a 3¼-inch curb for the brick. On hills the road was widened to 22 feet and the curb increased to 11 inches allowing 6¼ inches of curb to remain after the 4-inch hillside brick had been laid.

Grading operations on this job were started October 1, 1927, and concreting on October 14. Work was stopped by cold weather on November 3 as far as concreting was concerned and was started again on May 14, 1928. The job was delayed considerably by the cold and wet weather in the early spring but will be completed by September 1, 1928. The base was completed June 16, 1928.

CONCRETE FOUNDATION

After the work of grading was completed the contractor set up a well-balanced concreting organization. The grading was handled by a Thew gas shovel and a blade grader hauled by a Caterpillar tractor. Western rotary scrapers were also used in close quarters where the blade grader could not operate to advantage. The final subgrade was finished with a Lakewood subgrader.

Slag for the concrete was hauled from Belt Line and 73rd Street, Cleveland, about a 10-mile pull. Sand purchased in Bedford, Ohio, was delivered by rail at the same point as the slag and batched there for the trucks. Cement was also delivered in carload lots and stocked along the shoulders of the road and covered with tarpaulins.

The trucks delivered the batches to the Koehring 27E paver which mixed them 1¼ minutes and delivered the batch to the subgrade by spreading uniformly, minimizing the amount of hand work and also quite accurately fixing the elevation for the placing of the 54-pound Truscon welded-mesh reinforcing which was placed 3 inches below the surface. The accompanying diagram shows the section of the concrete foundation with dimensions. Cement was added to the batches by first dumping the bags from the stock piles along the road into concrete carts and then as the batch was dumped from the trucks the cart was run up and the

cement dumped into the skip. Six bags of Standard cement were used per batch. The mix specified as 1:7 was used as a 1:2.75:4.25 as producing the best concrete.

For the main section of the foundation, Blaw-Knox 12-inch steel forms were used with 3¼-inch curb forms set on top as the work was poured. Where the 11-inch curb was used on hillside work the 12-inch forms were set first with 11-inch forms on top bolted securely.

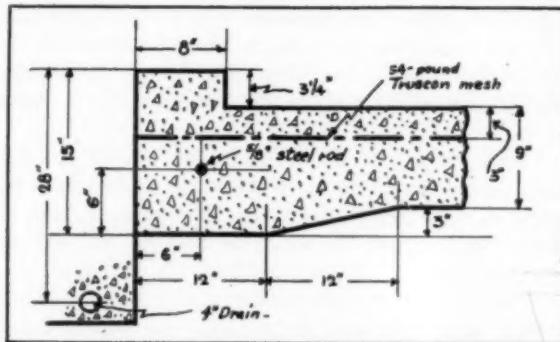
At the end of a day's concreting, there being no expansion joints in the foundation course, the contractor showed ingenuity in making a very effective dove-tailed joint. A heavy plank was cut to exact contour of the road foundation and a Truscon steel center strip bolted to it. This was oiled and made an excellent key for the next day's pouring. The Lakewood finishing machine could operate over the plank and thus finish the foundation to the very end without trouble.

DRAINAGE OPERATIONS

Immediately following the completion of a section of the foundation course the side drains were installed. These are of 4-inch vitrified clay pipe set next to the foundation at a depth of 32 inches from the crown of the road. Each joint was wrapped in burlap and then the whole pipe covered with No. 2 slag. The shoulders covering these drains were three feet wide and rolled with a 5-ton roller.

BRICK LAYING

The entire job of brick hauling and laying was sublet to F. O. Pyncheon of Cleveland, who handled the work with a remarkably small but fast gang. The foundation was allowed to cure for 21 days before the hauling of brick was permitted. As soon as a section was opened the brick contractor hauled in the Metropolitan wire-cut brick from the railroad siding at Strongsville, a distance of about 12 miles and stocked it at the roadside.



Section of 9-inch Concrete Foundation and Curb for Brick Pavement

The only mechanical equipment employed was a roller conveyor to handle the brick from the side of the road to the men racking the brick for the droppers. There were 5 men feeding the conveyors, 4 men racking and 2 men dropping. The brick, after being culled under the direction of the state inspector, were rolled to a firm set in the $\frac{3}{4}$ -inch cushion of granulated slag by a 2-ton Iroquois steam tandem roller working along the roadway.

Traffic irons this out very quickly, forcing the surface asphalt and slag into the upper portions of the spaces between the bricks. The road is opened to traffic within a half-hour after the asphalt is poured. Approximately 2,800 linear feet of 4-inch hillside brick were set on this job.

PERSONNEL

The work was handled under the supervision of Dan



EQUIPMENT AND METHODS EMPLOYED ON THE BALDWIN BROTHERS BRICK HIGHWAY JOB ON CONCRETE FOUNDATION SOUTH OF NORTH ROYALTON, OHIO

1. Koehring 27-E paver, Lakewood finisher, cement covered with tarpaulin to protect it from the continuous rains and other miscellaneous equipment used in pouring the concrete foundation. 2. Pulling stakes prior to removing the forms. 3. Covering drain tile joints with strips of building paper. 4. Tile laid in trench adjacent to concrete foundation. 5. Filling drain trench with slag. 6. The brick-laying gang exemplified perpetual motion

ASPHALT FILLER

As soon as a sufficient section of pavement was laid the brick gang was taken off laying and poured the asphalt filler. The filler was received from the Cuyahoga Asphalt Co. of Cleveland, in 1,000-gallon tanks heated by a coal fire. Immediately after pouring, the brick were covered with a fine coating of granulated slag.

Davis, Engineer-Inspector for the State, with headquarters in Cleveland, P. F. Kelly was Assistant Engineer for the State and Stanley Kofron, Inspector for Cuyahoga County, on brick work. G. W. Jackson was County Inspector for foundation and drainage. John W. Johnson was Superintendent for the contractors, Baldwin Bros., 1395 Union Trust Building, Cleveland, Ohio.

Measurement of Materials for Concrete

By R. T. Giles

Chief Engineer, Concrete Control, Blaw-Knox Co., Pittsburgh, Pa.



THERE are several general conditions as to the requirements of measuring equipment which should be kept constantly in mind. First, no equipment should be allowed which will give more material than the specified amount. Any error likely to occur should be of such a nature as would give an under-run of material in-

stead of an overrun. Second, the measuring equipment should be easy to calibrate for accuracy, and with its accuracy once determined, it should produce automatically the same batch, regardless of the previous conditions of the aggregate, without further changes. Third, the equipment should be so designed mechanically that the accuracy of the equipment could not be affected by failure in mechanical operation. Fourth, the equipment should be of such nature that special calibrating equipment would not be necessary and that the calibrating necessary should be such that the average inspector could satisfactorily make the necessary tests. Fifth, the equipment should be of such a nature that the personal element of the inspector would affect the results the least possible.

Specifications such as are outlined here may not be economic and it is very doubtful if equipment can be perfected to meet all the requirements outlined, but the nearer these specifications are approached, the more ideal will be the results.

VOLUMETRIC MEASUREMENT OF FINE AGGREGATES

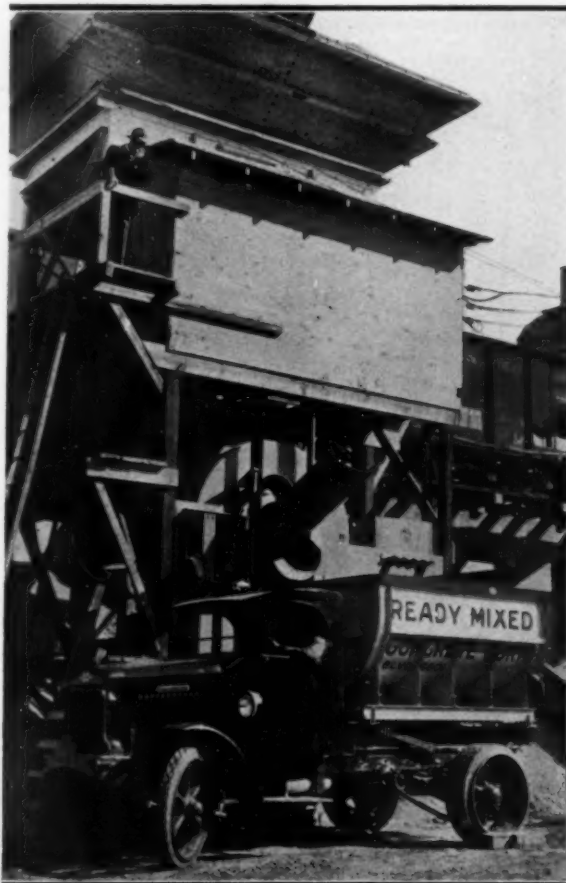
The fine aggregate having different characteristics from the coarse aggregates, the method for controlling each will be considered, with the fine aggregate being considered first. The most commonly used method in the past has been the volumetric measurement of the fine aggregates. As is well known, the bulking of the sand limits very materially the value of this method. Methods for correcting the volume for bulking necessitates the making of numerous tests and serious interference with the routine operation of the contractor. The accuracy of this method will depend almost entirely upon the accuracy of the inspector and to a large extent upon the attitude of the inspector in regards to the number of tests made.

WEIGHING OF FINE AGGREGATES

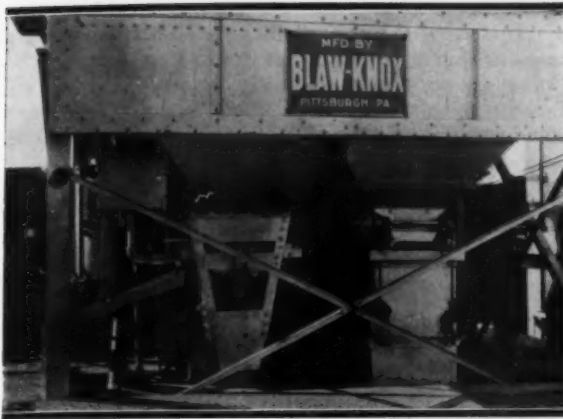
The weighing of the fine aggregate is being used very extensively and has many desirable features. The weighing method for the measurement of concrete aggregate was first started on the Iowa Highway Department work under the direction of R. W. Crum. Many highway departments have now adopted weight measurement with beneficial results to the quality and economy of their work. There is hardly any question

but that weighing under ideal conditions will give highly satisfactory results. One of the most common faults found with this method is the possibility of securing more material than the specifications allow. It is true that most weighing equipment provides a means for removing excess material, but unless the inspector is alert to see that this is done, it is questionable whether the specifications are carried out. Most scales are of the lever type and highly compounded so that any slight error on the end of the beam will be multiplied many times in the hopper. Accurate calibrating of this equipment is highly desirable and should be frequent, since due to its delicacy, it is the nature of the equipment to become incorrect from use. Serious errors may be caused by such unavoidable conditions, as dust and grit in the knife edges, and the scales becoming out of level due to the settlement of the bin at one corner.

On the other hand, the use of spring scales is very



General View of the Plant of the Ready-Mixed Concrete Corp., Richmond, Va., Showing the Blaw-Knox Steel Bins with 84 Tons Capacity, Divided into Three Compartments. The Mixer Is of Two Cubic Yards Capacity



Plant of the Ready Mixed Concrete Corporation, Richmond, Va., Where the Coarse Aggregate Is Measured by Weight and the Sand by Inundation

questionable, as is evidenced by the trend in scale manufacture. Many scale manufacturers feature the fact that no springs are used.

If highly accurate results are desired, great care should be taken in the tests necessary to the successful use of the scales. These tests will require the laboratory equipment be kept on the job, and that an inspector capable of determining the weights necessary be employed. The personal element of the inspector will be reflected in the results secured.

MEASURING FINE AGGREGATE BY INUNDATION

The other method for measuring the fine aggregate is known as the Inundation method, which is becoming more widely known and is being adopted by a large number of organizations. This method consists of an arrangement by which the sand is measured volumetrically in a saturated condition, and as a result gives the same volume of sand regardless of the previous condition of the aggregates. It is automatic and requires no tests after once being calibrated for the correct volume.

There is no possibility of securing an over-run of material, nor is it necessary to make tests to determine the weight per cubic foot or the percent of moisture of the sand. While it is true that the amount of moisture in the inundated sand will vary with the voids in the sand, this variable has been found on actual construction work to be of such a slight nature that the effect upon the resultant concrete is hardly noticeable. As an example showing the lack of effect of this variable, I would like to cite a bridge job on which inundation was used. A number of reinforced concrete piles were being built and a one-bag mixer was being used. After the amount of moisture in the inundated sand was determined, the amount of added water was limited to a certain amount and a bucket which would hold just this quantity of water was secured and given to the mixer operator. This job was started in March with the temperature at freezing and continued through the Summer and finished in the Fall. The amount of added water was never changed and the consistency of the concrete was so uniform that the inspector could detect no variation.

Any variation of voids in fine aggregate, which will

cause serious variation in the water content of the sand, when inundation is used, will cause an equal and possibly a greater variation in the volume of sand when weight is used.

The measurement of sand in a saturated condition for proportioning fine aggregate and water has been widely used by the Cuban National Highway and the North Carolina State Highway Department, as well as other states and cities. In many of these cases central proportioning plants are used. The adoption of this method and its application to both central mixing and central proportioning plants, on all types of concrete work, demonstrates its practicability and widespread use. It has been found that the quality of the concrete has been improved and an appreciable economy has also been obtained when sand is measured saturated.

MEASURING COARSE AGGREGATE

The measurement of the coarse aggregate is usually accomplished by one of two methods—volume or weight. Volume measurement is very extensively used, but is condemned by some engineers as unsatisfactory. It is questionable whether the faults found with this method should be attributed to volume measurement. It is the writer's opinion that the trouble encountered is due to the segregation of the coarse aggregate and not to the method. If this is true, efforts should be directed to eliminate segregation. There is, however, one inherent fault with volumetric measuring of coarse aggregate. The material, passing the minimum size screen specified, will occupy the voids in the coarser particles without affecting the total volume, yet the total amount of solids of the batch is increased and the proportions varied as a result. By the use of the weighing method this variable is eliminated.

As in the case with fine aggregate, weighing is being used extensively for the measurement of coarse aggregate. The segregation of the coarse aggregate causes a greater variable when weight is specified and for this reason a volume limitation should be stipulated in connection with the weighing requirements.

As an example, a one-bag batch of 1:2:4 concrete might be considered. We will assume a specific gravity of 2.65 for the stone and that the voids in the stone will vary from 40 per cent to 48 per cent. This was found to be actual field conditions in some tests in this connection. A well graded sample of stone with 40 per cent voids was found to weigh 100 pounds per cubic foot, with 40 per cent voids the total voids in the 4 cubic feet would be 4 cubic feet \times 40 per cent voids, or 1.6 cubic feet of voids. Four hundred pounds of stone with 48 per cent voids would be 4.8 cubic feet of stone and 4.8 cubic feet \times 48 per cent voids, or 2.3 cubic feet of voids.

From this, it is seen that the same volume of mortar must take care of 1.8 cubic feet of voids in one case, where as in the other case it is necessary to take care of 2.3 cubic feet of voids, and obviously the mortar in the last case is insufficient to give a satisfactory concrete.

This is of course an extreme case and it is not thought that this condition will be found regularly, but it emphasizes a condition that must be taken into consideration, as it is present to a greater or less degree in each batch.

It is not believed that volume measurement will overcome this condition, but it is less where the volume measurement is used, and unless a volume limitation is placed upon the batch in connection with the weighing of the coarse aggregate, the weighing will give the greater variable. Apparatus has been developed to overcome this condition and is obtainable from several sources. The same precautions should be exercised with the weighing of coarse aggregate as were cited with fine

aggregate.

The results from the weighing method or the measurement of fine aggregate in a saturated condition are superior to the results normally obtained by the volumetric method, and as a consequence many engineering organizations are requiring one or the other methods as a means of controlling the quality of concrete.

ACKNOWLEDGMENT.—From a paper presented at the annual meeting of the American Road Builders Association.

Developing the Practise of Welding Structures

A Paper Submitted by A. G. Bansmer, New Rochelle, N. Y., for the Lincoln Arc Welding Prize for 1927



RC welding as an art is sufficiently well established and its value and reliability proved to such an extent that there is or should be no valid objection to its use in place of riveting or bolting together of steel structures. The main requirement to accelerate the adoption of welding is a campaign of instruction and education among practising engineers, architects, technical schools and authorities in charge of building supervision. The establishment, adoption and official approval of rules governing values, methods and materials used, the compiling of standard details and values governing such details is needed. Finally a pamphlet should be published containing all this information and should be issued in connection with the handbooks prepared by the steel companies in conjunction with, and as an alternative to, data and details for riveted work.

The accompanying diagram is a suggestion of the method of developing such information. It shows a few applications, the practicability of which is self-evident.

COLUMN BASE

In the lower left hand corner of this drawing is shown a column base proportioned for about 800,000 pounds of axial load and supported on a concrete pier. With 500 pounds per square inch pressure on the concrete this load would require a slab about 40 inches square and $4\frac{1}{2}$ inches thick weighing 2040 pounds. With stiffening ribs arranged about as shown, the thickness of the slab can be reduced to 2 inches. The ribs, in order to resist bearing and buckling, would have to be 1-inch thick and in order to resist upward shear along the column shaft a height of 12 inches would suffice with an average thickness of weld metal of $\frac{5}{16}$ -inch, allowing about 10,000 pounds in shear per square inch of weld metal as is customary for soft steel rivets. This base would weigh about 1,150 pounds, a saving of nearly 900 pounds as compared with a plain slab which would certainly more than pay for the labor involved.

ROLLED COLUMN SECTIONS

Since rolled column sections are now available which meet all requirements of buildings of moderate height, these only are considered. The flange and web thickness of these columns in most cases necessitates the drilling instead of punching of connection holes, often to template. The use of welded beam seats, base and splice connections will save the drilling and the labor incident thereto. The seats weigh less and the attaching by welding costs less than riveting, even if this be done in the shop, since welding is a one-man job, while riveting gangs comprise not less than 4 men. A seat connection of this type should, however, be proportioned with sufficient depth that the two sided vertical weld alone can take all vertical load at say 2000 pounds per lineal inch for each side or 4000 pounds per inch of depth. This will correspond to less than 10,000 pounds per square inch of weld metal of an average thickness of $\frac{1}{4}$ -inch. A small side angle should be used on the flange face of columns to facilitate erection and to properly center the beam. This side angle would be welded to the column and engage a hole drilled or punched in the beam web.

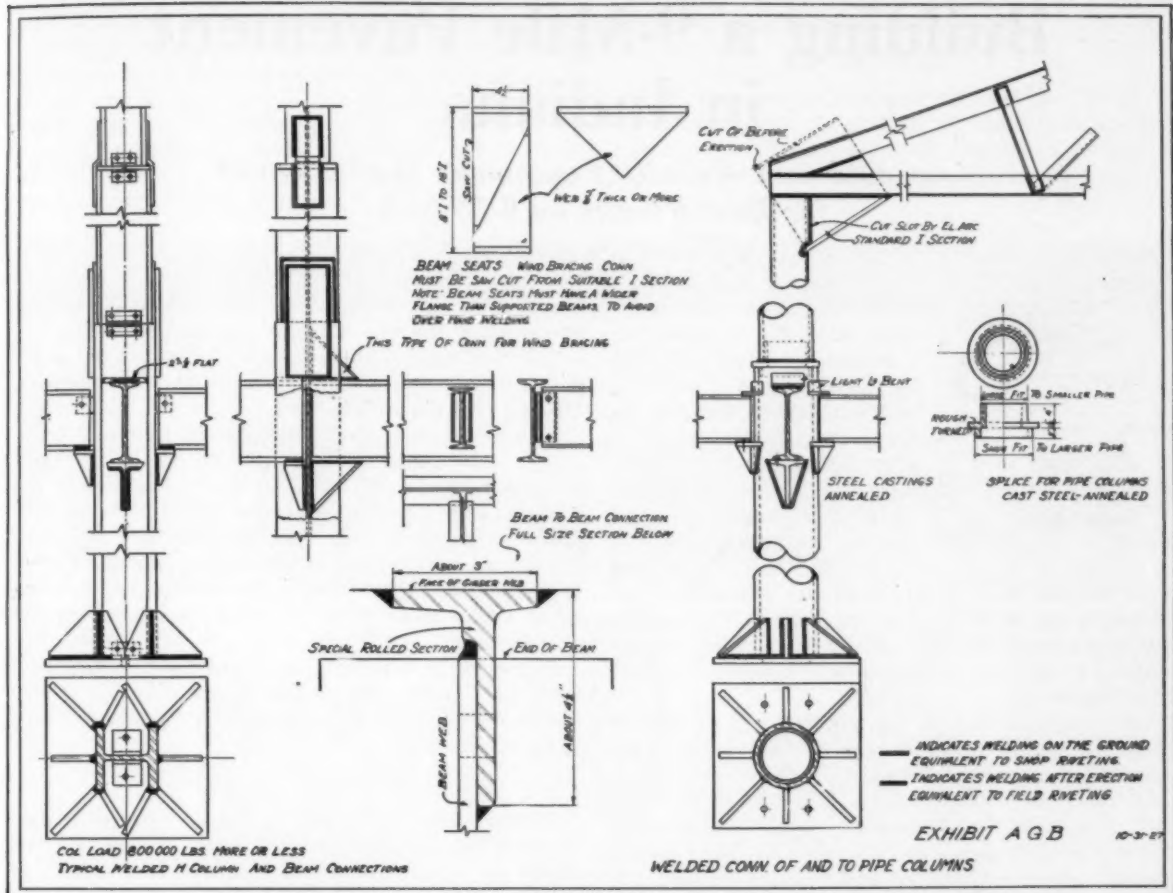
BEAM CONNECTIONS

Beam connections to the webs of columns can be centered by means of a flat, 2 to 4 inches wide and about $\frac{1}{2}$ -inch thick, welded to the top flange of the beam before erection and to the inner faces of the column flanges after the beams are placed and the columns plumbed and fixed in position.

After all beams in one tier are placed, their lower flanges may be welded to the seats. This welding need not be heavy unless it is desired to have them act as wind braces. Where wind bracing is required, a connection as shown on the drawing for that purpose will be very effective.

Column splices can be made as strong as desired up to the full bending strength of the column with less material than would be required for a riveted splice. Filler plates and splice plates, however, must be narrower than the surface to which they are welded.

For connection of beams to beams a special rolled section is suggested.



Suggested Details for Welding Beams to H-Section and Round Columns, Indicating Whether Welding is the Equivalent of Shop Riveting or Field Riveting

STEEL ORDERS SIMPLIFIED

With connections of this type it will be possible for the steel contractor to order all columns from the mills cut to exact lengths and with the ends finished for bearing shipped direct to the site as the few holes that may be required can be laid and drilled on the job. Beams, also, can be cut at the mill with the customary tolerance and shipped to the site. The marking and laying out of connections and connection holes, the drilling, welding of seats, guide angles, splice plates and so forth should be done on the ground, after which the work of erection can be carried on as with riveted work with fewer men, in less time and almost total absence of noise and danger from falling rivets.

It is not suggested to eliminate all bolting or riveting since for very tall buildings and for light frames, such as cornices, elevators, stairs and stair shafts, where considerable shop work is involved, it may in some cases work out cheaper to prepare all members for field bolting or riveting, but in the great majority of cases, the ideas and methods suggested will prove of distinct advantage, resulting in the saving of some material and in a larger saving of freight, handling and labor costs.

WELDED CONNECTIONS TO ROUND COLUMNS

At the right of the drawing is shown an application of welded connections to round columns. Pipe sections

are available in a wide range of thickness and diameters from 20 inches down, sufficing for a building of 12 to 15 stories. They can be filled with concrete after erection, thereby their strength and heat-resisting qualities can be greatly increased. Round columns in many cases are greatly preferable to H-sections or built up columns, as they are the most efficient supports and at the same time offer less obstruction to travel, transport and to light than any other section. In multi-story garages, warehouses, loft and factory buildings, these columns should be preferred to other shapes and since with arc welding they can be built up to reasonable heights and beams, spandrels, trusses, etc., connected in a safe and permanent manner, this type of column should find considerable favor. Seats and splice connections will have to be cast steel, but with present day development of steel casting and machine molding, this forms no serious drawback.

SAVING IN COSTS

The time for the introduction of welding structural steel work is ripe. Transportation and shop labor costs are high and likely to remain so, but the cost of erection of steel work is out of all proportion, often amounting to 50 per cent of the cost of the delivered materials. Any improvements tending to reduce this item will be of real and lasting benefit to the construction industry as a whole and to the producers of building materials.

Building a 9-Mile Pavement in Indiana

*New, Old and Rebuilt Equipment Well-Teamed
for Best Results on 9-7-9-inch
18-foot Pavement*



STANDARD well-known equipment, some of it in service for a number of years was used by the Charles W. Clark Co., of Terre Haute, Ind., on its 9-mile concrete road job south from Boswell, Ind., on U. S. Route 41. The contract was awarded in June, 1927, and grading was started July 1, 1927. The first paving was

begun August 15, 1927, and work was discontinued for the winter just after Thanksgiving. The 1928 operations were commenced March 25 with more grading and the concreting April 26. Pouring was completed shortly after August 1.

The first work was at the southern end of the job where the haul for aggregate was the full 9 miles. Four miles of concrete were poured at the south end in 1927, then there was a mile of relocation for which the State had not secured the right-of-way. The mile north of this was the last poured in 1927. In 1928, the mile gap was first graded and poured, and then the remainder of the project, working north.

GRADING

Rough grading was handled with a Western elevating grader, hauled by a Caterpillar Sixty, dumping into 3-up Western dump wagons, and hauled to fill. This work was subcontracted to Burk & Shore, of Terre Haute, Ind., who also handled the 1928 grading on the 1 mile of relocation. The general contractor handled all other 1928 grading with Western No. 2 wheelers and a 5-ton Caterpillar and a No. 7 Adams grader. An Adams King Jr. with a 6-foot blade pulled by a Fordson with Rigid Rail crawlers was used for dressing up the grade.

A Hug subgrade planer was used for the final grade using the Fordson to pull it. An Austin Pup 3-ton roller was used for the final rolling ahead of the mixer.

FORM SETTING

A Ted Carr formgrader was used to prepare the form trench and a foreman with two men set the forms. Two men were used on the formgrader, one to operate it and the other to throw over the dirt from the blade. Heltzel 9-inch forms were used.

UNLOADING AGGREGATE

Both sand and gravel for the job were purchased from the Western Indiana Gravel Co., Lafayette, Ind., and delivered by rail in hopper-bottom cars. The gravel was unloaded by a rebuilt Stephens-Adamson bucket conveyor 45 feet long operated by a Fordson. The conveyor delivered the gravel to a 35-yard Johnson wooden

bin with a Johnson batcher. Two men operated the gravel plant and also two ran the sand unloader.

The sand was unloaded from a pit beneath the track with a Barber-Greene 45-foot belt conveyor to a Johnson 10-yard steel bin with batcher.

Cement was unloaded from cars 600 feet east of the gravel plant and was loaded directly to the trucks, 6 bags to a batch. When a car was unloaded and the mixer was not running the cement was stored in a shed next to the gravel unloader and then the bags were thrown on at that point after the trucks had received both gravel and sand when no car was on the oil siding which was separate from the siding used for the gravel and sand cars.

Noble trucks with Lee steel hand dump bodies were used for hauling the batches to the mixer. Twelve Noble trucks and 4 hired Fords and Chevrolet trucks made up the fleet.

CONCRETING OPERATIONS

As the trucks approached the mixer with the batches they stopped at a small platform where two men stepped on to the truck and cut and emptied the 6 bags of cement. This is an innovation and was a real saver of energy as the men were not forced to climb on to the trucks every time to empty the sacks. The trucks then ran through a breach in the forms and turned themselves, backing to the mixer.

The 21E Koehring paver laid an average of 800 feet of the 9-7-9-inch, 18-foot wide pavement daily throughout the progress of the work. Two men dumped the trucks into the mixer skip. There was one mixer operator, a boy to oil the forms and the marginal bars and to wet down the subgrade behind the mixer.

A home-made subgrade checker was pulled along by hand after the mixer to show up any high spots. This



Koehring 21-E Paver on the Charles W. Clarke Job at Boswell, Ind.

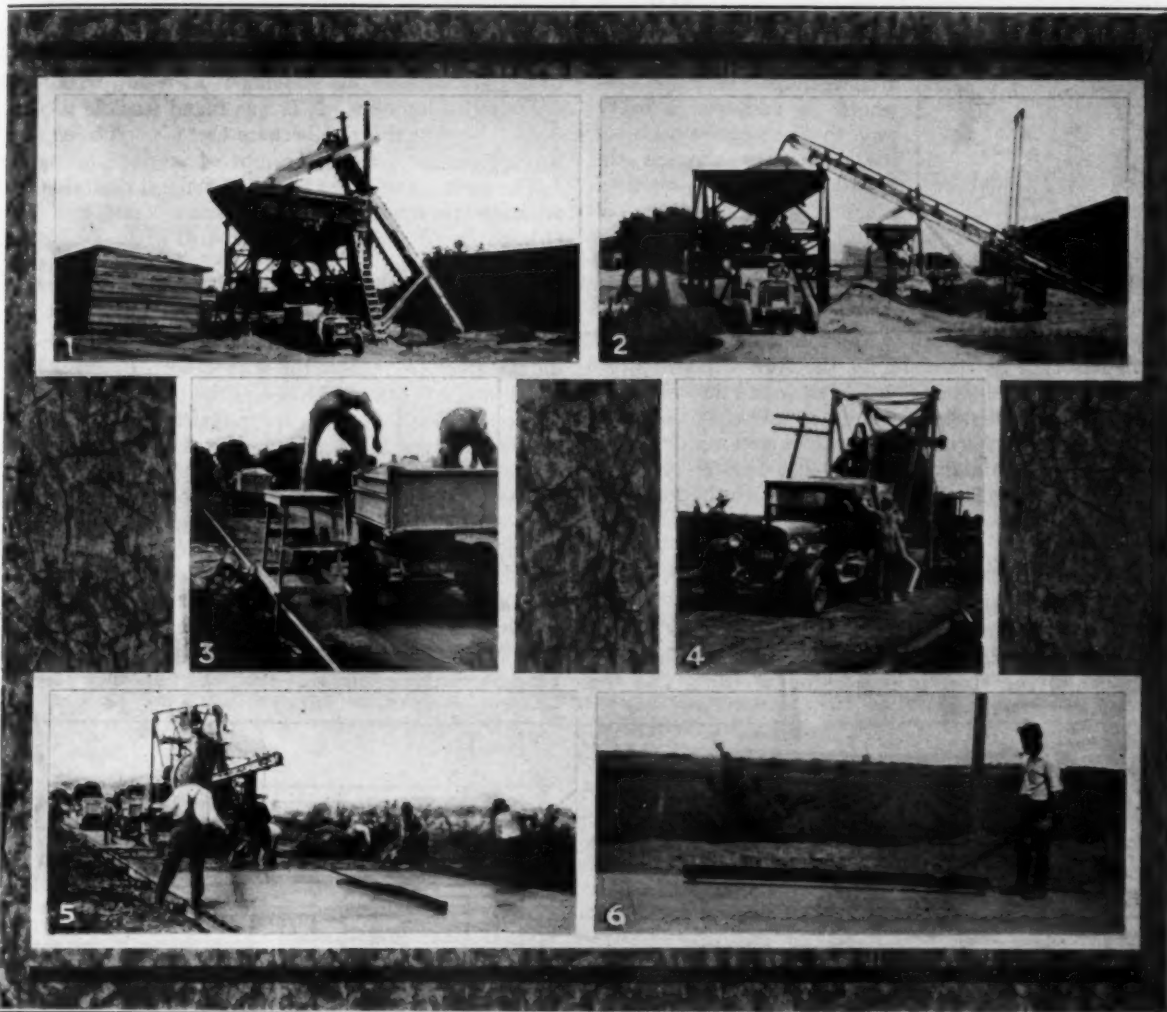
Kahlman center strip was used and set by the spreaders. The strip was $6\frac{1}{2}$ inches high, 10 feet long and was made of 4-inch pipe with holes through which sharpened bolts were set to the proper contour.

Two men spread and two men shoveled to the Lake-wood strike-off. One of the men was designated as the finisher operator. Following the finisher were two men who operated the 10-foot straight-edges; these men also did the hand finishing of the edge.

$\frac{1}{4}$ -inch in 10 feet this must be checked by the inspector before the straw is spread and sprinkled.

PERSONNEL

R. E. Hanson was Superintendent for the Charles W. Clark Co. on this job and M. D. Baker was Resident Engineer for the Indiana State Highway Commission. H. D. Stewart was foreman of the concreting gang.



EQUIPMENT AND METHODS USED ON THE CHARLES W. CLARKE INDIANA STATE HIGHWAY JOB SOUTH OF BOSWELL

1. Gravel bucket unloader for sand operated by Fordson tractor discharging into Johnson bins. 2. Barber-Greene belt conveyor unloading sand to bins. Gravel unloader seen in background. 3. Platform for men who emptied cement on batches. The platform was readily moved along the subgrade, if necessary, and saved the men's energy as they did not have to climb onto the truck each time. 4. Dumping batches into the skip of the Koehring 27-E paver. 5. Using 10-foot float behind the mixer to keep the waves out of the pavement. 6. Smoothness tester devised and built on the job by the state inspector but later discarded as not accurate

was set with 4 steel pins and $\frac{5}{8}$ -inch dowels 4 feet long on 5-foot centers. Marginal bars running continuous and $\frac{3}{4}$ -inch in diameter were set along the edge 6 inches in from the form and $4\frac{1}{2}$ inches from the base.

SMOOTHNESS CHECKER

Since the requirements of the State specifications are that the pavement shall not show a rise of more than

Theodore Roosevelt Bridge Completed in North Dakota

The Theodore Roosevelt bridge at Chaloner's Ferry, N. D., across the Little Missouri river 17 miles south of Watford City was dedicated July 17. The bridge cost \$100,000 and was built by the Minneapolis Bridge Company, to whom the contract was let July 23, 1927. The bridge connects an important part of McKenzie county with the main body of the county.

Construction of the Poydras Street Coffee Import Terminal

Material Handled Both by Floating and Land Equipment on New Orleans Wharf Project



THE practical need for building a coffee import terminal that would be adapted in every way to the requirements of the trade has afforded the Board of Commissioners of the Port of New Orleans opportunity to adopt, for the purpose, a type of reinforced concrete and steel construction on wooden pile foundation.

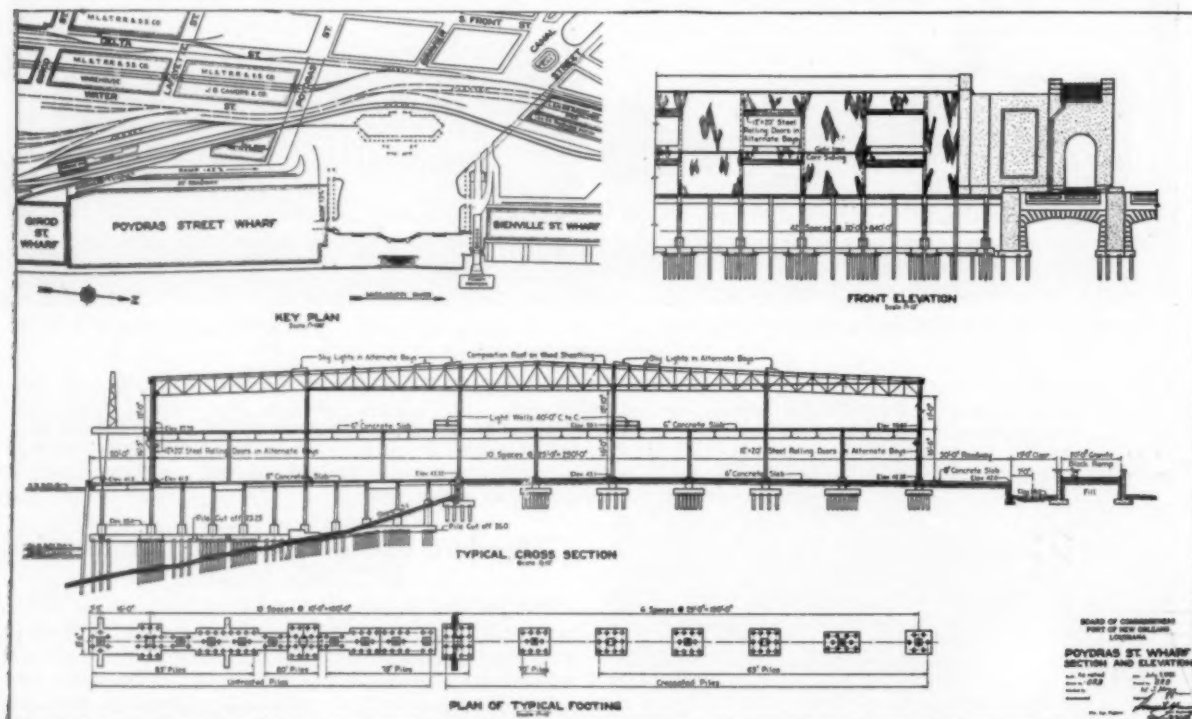
The factors of utility and safety have determined a lighter type as standard for the New Orleans wharf system as a whole, but it has been found desirable and practicable in this case to build a heavier structure of more lasting materials, with consequent reduction of fire risk and maintenance cost. The heavier type was decided upon for several reasons, of which the following may be mentioned:

TYPE OF CONSTRUCTION

1, At the most desirable location, and the chosen location, for the coffee terminal, the river bank is reasonably stable, more stable than at points where the main channel of the river is nearer to the bank, and the

Board's engineers are reasonably sure that there is no danger of such serious settlement as would wreck this character of building. 2, It was found feasible to use a 2-story shed at this site because there is sufficient room in the rear for vehicular ramps of ingress and egress. 3, The methods of coffee handling make it desirable that all coffee be imported over the same wharf, and New Orleans imports of coffee are upwards of 3,000,000 bags a year. 4, As all coffee is handled from the wharf by drays and motor trucks, a second deck could be made just as accessible as the first, by means of ramps. It is not generally feasible or economical to use 2-story sheds on the river front, and the only other existing 2-story wharf-house is that which serves the public cotton warehouse. In each instance the physical conditions have lent themselves admirably to the accommodations required for the special commodity wharves.

The Poydras Street Wharf, as the coffee terminal is to be known, is well advanced as to construction. Stated briefly, it is a structure with 1,370 feet frontage on the Mississippi River, carrying a 2-story shed 840 x 250 feet and a single-story shed 520 x 200 feet. The full width is 300 feet, including a 30-foot car-floor-level roadway-apron in rear—standard rear apron for the New Orleans wharves—and a 20-foot wharf apron. The floor



Sections and Elevations of the Poydras Street Wharf Built by the Board of Commissioners, Port of New Orleans, La.



Cofferdam Piling Placed Ahead of Construction Work. The Tower and Chute for Pouring Concrete Are Seen at the Left Background

area of the covered space will be approximately 530,000 square feet. The area of the front and rear aprons will be about 77,000 square feet. Live loads of 350 pounds are provided for on both decks. The single-story building will have railroad service both on the river apron and in the rear, while the 2-story building will have tracks in the rear only. Rail service is not required for coffee handling, but these wharves are strictly transit warehouses and will be available for other high-class freight if and when not required for actual coffee import purposes. Both buildings and both floors will be accessible to motor and horse-drawn vehicles. Movable steel bridges will travel on the front apron, connecting ship's tackle with the second floor. The reinforced concrete firewalls extend from the first deck to a point 5 feet above the roof—they are not needed below the first deck, as there is nothing combustible below that deck.

SUBSTRUCTURE

The substructure design calls for a series of pile footings spaced 20 feet on centers, extending from levee to front of wharf, capped with reinforced concrete beams, and carrying short pedestals for Bethlehem section steel columns. The tops of the pedestals are at elevation 28 Cairo Datum, and the elevation of the first floor deck is at 43.1 Cairo Datum. The pile cut-off is at 23.25 Cairo Datum. The piling used from the levee toward the channel are of untreated pine, 75 to 85 feet long, and will be entirely submerged practically at all times. The maximum loading was figured at approximately 10 tons per pile. The high-level foundations have creosoted pine piles, 16-pound full-cell treatment, in lengths of 60 to 75 feet.

The outbound ramp for loaded vehicles is of 5 per cent grade for part of its length and about 3 per cent near its foot, the flatter grade enabling vehicles to check up on approaching the railway crossing which lies in rear and permitting horse-drawn vehicles to negotiate the slope without the use of brakes. The grade on the inbound ramp is 7.15 per cent. The ramps are of reinforced concrete, with granite block pavement.

The Dock Board, as the port commission is usually called, is a public body, an agency of the State of Louisiana, and controls the use of all waterfrontage within the port. Its engineering staff draws all plans

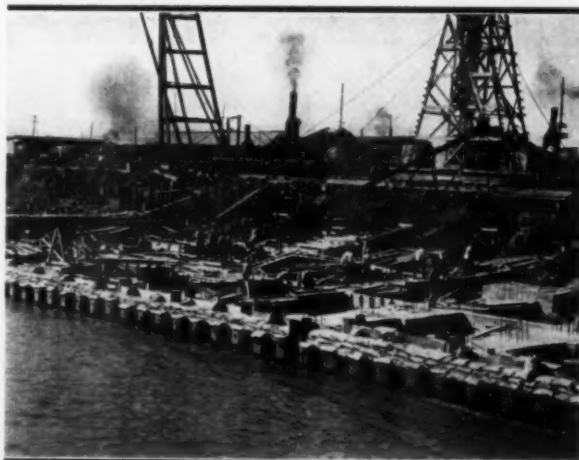
for new construction and exercises supervision and inspection throughout the construction period of each job. It is the general practice of the Board to let contracts to private contractors for all major construction, on specifications of its engineers. On the present structure, which is costing approximately \$2,000,000, the low bidders who have been awarded principal contracts to date are the Dalgarn Construction Co., for foundations, Lukens Steel Co. for furnishing and erecting wharf steel, C. A. D. Bailey Co. for floor slab, for ramp to the second story and for firewalls, and Lukens Steel Co. for furnishing and erecting shed steel. These have been let successively as the work progressed, and further contracts are yet to be let.

PILES AND SHEET PILING

For the foundations about 9,000 piles were driven, of which some 6,000 were untreated piles on the river side of the levee. Three thousand were used for the high-level foundation on top of the levee. As the river did not remain at its lowest stage for more than two weeks it was found necessary to construct a steel sheet-pile cofferdam, within which the wooden piling could be cut off and footings placed. The sheet piling had to be driven in water 30 feet deep and, as it could not be braced except near the top, the span between bracing and mud-line was unusually long—and the only sheet piling on the market which would fulfill conditions was manufactured in Germany, some being available from stock carried in this country, while some had to be imported for the purpose.

The total length of sheet-pile cofferdam constructed was approximately 1,300 feet, exclusive of end ties. It was built in seven sections, the longest being 220 feet and the shortest 120 feet. The ends of each section consisted of steel piling extending from the front line of the cofferdam inshore for 40 feet. Beyond this point dirt levees were built as necessary.

The steel sheet piling consisted of 150 pieces of 50-foot length, 200 pieces of 48-foot length, and 200 pieces of 40-foot length, of section No. 3 "Larsen" steel piling. The ends were of varying lengths of section No. 2. These materials allowed for construction in three sections at one time, and the procedure of construction



Section of the Cofferdam Showing Sacks Piled on Top of Walling to Prevent Waves from Washing in. The Finished Concrete Footings are Shown



Footings Curing in the Forms Ahead of Underframe Construction

carried out was to allow the contractor the use of two sections in which to perform construction work while the third section was being installed. As the contractor progressed into the third section, the first was removed and re-used in an advanced section. The requirements of the contractor, to construct the foundations within the cofferdam, were that the water should not exceed 21.3 Cairo Datum. Outside the cofferdam the river elevation varied during the work from 22.4 to 27.5 Cairo Datum. The maximum head experienced, therefore, was approximately 6 feet. Cinders were placed in the joints of the cofferdam and after the first two days the river silt had effectively sealed the joints, so that the piling was practically watertight, and the cofferdam was kept dry with one 6-inch centrifugal motor-driven pump. Almost the entire lot of sheet piling was used twice on this work, and after pulling it was in practically the same condition as when originally received. It has been used on another job since then, and is available for further use.

In constructing the cofferdam, tops of the sheet piling were kept at approximately 30 Cairo Datum. As support and bracing for the sheet piling there were used one vertical round pile 85 feet long, and one batter pile 70 feet long, at 10-foot intervals. Waling timbers, 12 by 12, were provided at about elevation 27 Cairo Datum, both inside and outside the sheet piling. The batter piles were connected to the waling and vertical piles at this point. This was the only set of waling used and the only point at which the cofferdam was supported above ground level, which was at about zero Cairo Datum. The contractor who built the footings used a mixer mounted on a traveling platform, with a tower and chute system for pouring the concrete into forms.

The erection of wharf steel on the concrete footings was begun as soon as the foundation contractor was sufficiently out of the way, and this was carried on by means of a floating derrick from the river side and by means of a crawler crane which traveled on top of the steel toward the land side of the structure. The steel was delivered along the bank by means of automobile trucks and was unloaded from these trucks and erected by the crawler crane. That which was erected by the floating derrick was delivered in barges alongside the

derrick. It happens that the Lukens plant which fabricated this steel is located on the New Orleans Inner Harbor Navigation Canal, a circumstance which permitted delivery direct from the factory by water or by land. The erection of this steel was carried on very expeditiously and the steel erector completed the job in 54 days, or 36 days ahead of his contract date.

The construction of the reinforced concrete floor slab which constitutes the wharf deck for the first floor now is in progress. This is a 6-inch reinforced concrete slab carried by the Bethlehem shapes and standard I-beam, except that portion which rests on the earth-fill on the crown of the levee. This construction has been carried on by the contractor with a central mixing plant, using Ford trucks equipped with regular concrete bodies for delivering to different parts of the job. For building the slab over the structural steel wharf the contractor has used a system of portable runways in connection with the operation of the Ford trucks. These runways were elevated about three feet above the floor, supported at proper intervals on the steel floor beams. The contract has not yet been let for the slab on the second deck.

The steel superstructure has been contracted for and work thereon is commencing. Roof trusses will be of the usual type, and channels will be used for purlins. Walls of the warehouses will be of galvanized corrugated steel attached to channel longitudinal girts by means of wire clips. These warehouses will be equipped with rolling steel doors located in alternate bays, with openings approximately 20 feet wide x 12 feet high. Lighting will be accomplished by means of sky lights and monitor lights for day and electric lights for night. Light wells through the upper floor slab will permit daylight to reach the lower story. The superstructure, in fact, conforms to the usual Dock Board standards, with a second deck as the distinguishing feature.

CONSTRUCTION EQUIPMENT

For pouring the concrete in low level footings and column pedestals the contractor used a plant consisting of an Insley tower of wood construction mounted on a timber frame base. The whole unit was portable and traveled on wooden rollers supported on a timber runway laid on the front edge of the levee. The power to move this unit was furnished by a steam hoist engine



Erecting Steel Underframes for Wharf Deck. Delivery Shown from Land and Water Sides



Riprap for Protecting the Slope of the Levee Against Wave Action. A Bitumastic Coating is Being Applied to the Under-frame of the Wharf

mounted on the timber base, which engine also hoisted the concrete on the tower.

On this portable unit was mounted a Jaeger No. 14-L gasoline-driven mixer of $\frac{3}{4}$ -yard capacity which dumped directly into an Insley hoisting bucket. The concrete was hoisted in the hoisting bucket to the top of the tower where it was dumped into an Insley hopper and chutes which were suspended from a boom and counter-balanced truss to the point of discharge.

The concrete materials were stored directly behind the line of travel of the portable mixing plant and were conveyed by wheelbarrows from storage to the receiving hopper of the mixer.

For pouring miscellaneous concrete the contractor used a No. 7-S Knickerbocker portable mixer.

The pile driving equipment consisted of three turntable drivers and one floating driver. All drivers were equipped with No. 1 Vulcan steam hammers. The hoisting engines were Lambert and American hoist engines and the turntable drivers were equipped with Lidgerwood swinging engines.

A Byers crawler crane was used for unloading materials and for excavating the low level footings. Also a turntable driver with pile boom was used for hoisting and handling dump buckets where excavation was done by hand shoveling into buckets.

Concrete materials and piling were delivered on cars at rear of the site. They were unloaded and handled by the crane to proper locations for use.

In driving sheet piling, which was done by the Board's forces, a floating driver and floating derrick were used. A Vulcan No. 1 steam hammer was used on the driver and a McKiernan-Terry steam driven hammer was used on the derrick.

In the erection of the structural steel the contractor used a McMyler-Interstate crawler crane to erect steel on the landside portion and a floating derrick to erect the riverside portion of the wharf. Steel for the landside portion was delivered to the site of the work by truck, unloaded and erected by the crane which traveled on the erected steel. Steel for the riverside portion was delivered alongside the derrick on a barge.

Statement Regarding Receivership of Austin Machinery Corporation

CHARLES W. BRODRICK, Secretary-Treasurer, the Austin Machinery Co., 2969-3015 Lake Shore Drive, Muskegon, Mich., sends the following statement regarding the recent appointment of a receiver for the Austin Machinery Corp. and asks that the statement be published that the entire construction industry may fully understand conditions.

"Prior to July, 1924, under the management up to that time the Austin Machinery Corp., had seriously impaired its working capital due to a combination of unforeseen business conditions, errors of judgment and high appraisal values at which properties had been purchased at and after organization of the company in 1920.

"At that time, July, 1924, and because of such a situation, O. A. Seyferth was placed in charge of the business by the controlling interest which was and is the owner of all outstanding bonds and the largest creditor.

"Since July, 1924, marked improvement have been made in the quality and design of the equipment offered by the Austin Machinery Corp., and efforts were continually made to effect an agreement with other stockholders whereby an internal reorganization of the capital structure might be effected without the expense, delay and publicity naturally to follow a forced reorganization. Such efforts were fruitless and the alternative was then taken by the appointment of a receiver.

"Believing that the interest of the trade is concerned not with difference between ownership interests but with the effect upon customers and creditors, we believe that the following information is of general interest.

"This action is not being taken because of recent developments, but to remedy a condition existing since 1924, in fact, from early in 1925 up to the date of receivership, all bills were regularly paid when due and cash discounts taken when offered. All unpaid bills, approximately \$40,000, consisted of current bills and these are to be paid in full. The application for receivership contemplates payment of all other creditors and provides for continued operation of the business. The action was not taken because of any recent slump in business. As a matter of fact, our sales have been such that we have been forced to work a night shift and overtime for the day crew most of the past four months. Present, as well as prospective owners of Austin equipment need feel no concern."

Contract Awarded for Lac Seul Dam

ANNOUNCEMENT has been made of the award, on a cost plus basis, to Morrow & Beatty of Peterborough, Ontario, of the contract for the construction of a storage dam and power house at Ear Falls, on the Lac Seul-Winnipeg River system. Award of the contract follows close on the heels of the recent joint proclamation by the Ontario, Manitoba and Dominion governments of special legislation authorizing the gigantic storage project.

All engineering details in connection with the scheme will be handled by the Hydro Commission. The dam will cost about \$750,000.



A Cletrac-40 Owned by Walter Tye & Son, Pleasureville, Ky., Handling Two 6-Yard Euclid Crawler Wagons

Who's Who in Construction

A Series of Reports from Active Contractors Published Monthly

Cooper-Little Co., Detroit, Mich., Maccabees Building. Incorporated May, 1915. Bus. vol. B. The name of this firm was changed from Cooper-Widenmann Construction Co. in 1926. Officers: E. B. Cooper, President; J. C. Little, Vice-president; Gilbert Douglas, Secretary-Treasurer. Major contracts: 1925, Roosevelt School; 1926, Barnes, Gibson, Raymond Co. factory and C-G Spring and Bumper Co. factory; 1927, Norton Co. warehouse, St. Rose Church and St. Dominic School. Member: General Builders Association of Detroit, Associated Building Employers of Detroit, and A. G. C. of A.

Lundgren & Carlson, Topeka, Kans., 213 Jackson Street. Organized May 1, 1900. Bus. vol. D. Officers: J. A. Lundgren, President. Major contracts: 1923-4, Assumption Church, \$150,000; 1924, Security Benefit Assn. Hospital, \$175,000; 1925, Stormont Hospital, \$150,000; 1926, Stormont Office Building, \$150,000; 1927, Randolph Grade School, \$140,000, and A. T. & S. F. Ry. Co. warehouse at Argentine, Kans., \$70,000. Member: Master Builders Assn. of Kans., Associated Industries of Kans., and A. G. C. of A.

Bedford Construction Co., Inc., Utica, N. Y., Mayro Building. Branch office: 48 John Street, Ilion, N. Y. Organized July 1, 1927. Bus. vol. C. Officers: Edward Bedford, President and Treasurer; Earl K. Simpson, Vice-president; W. W. Inglis, Secretary. Major contracts: 1924, John F. Hughes School, Roseoe Conkling School, and Westminster Church House, Utica, N. Y.; 1925, two schools in Ilion, N. Y.; 1926, Rondaxe Hotel, and Old Forge High School, Old Forge, N. Y.; 1927, Utica State Hospital, Utica, N. Y., Willard State Hospital, Willard, N. Y., School at St. Regis Falls; 1928, Oneida County Tuberculosis Hospital Plant. Member: A. G. C. of A.

Geo. W. Condon Co., Omaha, Neb., 222-3-4 Grain Exchange Building. Organized February 1, 1926. Bus. vol. B. This company was started in 1901 by Geo. W. Condon, who operated as an individual. The present partnership consists of Mr. Condon, Wilber Cole, C. W. Cunningham and A. H. Carley. Other partnerships handling work for this company are Condon & Cunningham, Condon & Cole, Condon & Loomis, and Condon & Perry. Major contracts: grading and bridge work on about twenty Federal Aid highway jobs, 10 to 20 miles each, in Iowa; five F. A. highway jobs, 10 to 25 miles each, in Missouri; five F. A. bridge projects in Missouri and Iowa. Member: Iowa, Missouri and Nebraska Chapters of the Association of General Contractors.

National Concrete Construction Co., Louisville, Ky., 54 Board of Trade Building. Organized, 1895, incorporated, 1905. Bus. vol. D. Officers: J. B. Ohligschlager, President; A. J. Ohligschlager, Vice-president. Major contracts: Knights of Columbus Building, \$375,000; Louisville Water Co. filters, \$425,000; Federal Reserve Bank, \$125,000; Security Bank, \$75,000. Member: National Chamber of Commerce, Board of Trade, General Contractors Association of Louisville, and A. G. C. of A.

The Middle States Construction Co., Columbus, Ohio, 1183 Essex Avenue. Organized May, 1913. Bus. vol. B. Major contracts: 1925, Knights of Columbus

Club Building, Columbus, Ohio; 1925-26, Kroger Groc. & Baking Co. warehouse, Columbus; 1926, The Timken Roller Bearing Co. open hearth plant at Canton, Ohio; 1927, Hoadley Cut Stone Warehouse, Columbus, boiler house at Xenia, Ohio, for the State of Ohio, boiler house at Kent, Ohio, for the Kent State Normal School, boiler house at Columbus for the State School for the Deaf, and Carbonation plant at Columbus. Member: National Erectors Association, Columbus Employers Association, Columbus Chamber of Commerce, and A. G. C. of A.

Chas. A. Pike Co., Bloomington, Ind., 414 No. Morton Street. Organized February, 1925. Bus. vol. C. Officers: Chas. A. Pike, President and Owner; E. P. Young Secretary and Treasurer. Major contracts: The "plan service" idea has become one of the features of this organization, and incorporates the working out of nearly every detail in the arrangement and construction of a new home or building. Major contracts: The Wicks Co. Building,



E. P. Young.

Ben Beeovitz Building, First National Bank Building, Indiana University Field House, Kappa Kappa Gamma Sorority House, Delta Upsilon Fraternity House, Beta Theta Pi House, High School Coliseum, College Avenue Motor Sales Co., Bloomington Nash Motors Co., and City Waterworks Filtration Plant, all at Bloomington, Ind. Also many large and small fine residences. Member: Contractors Association of Indiana.

The Hodges Construction Co., Cincinnati, Ohio., 901-6 Chamber of Commerce Building. Organized May, 1922. Bus. vol. B. Officers: J. E. Hodges, President and Treasurer; P. C. Singer, Vice-president and Secretary. Major contracts: 1925, Women's Dormitories, Denison University; 1926, Children's Hospital; 1927, Cincinnati Chamber of Commerce Building, Viaduct for the Pennsylvania Railroad Co., Fountain Theatre, and water tanks for the city of Cincinnati. Member: Chamber of Commerce and A. G. C. of A.

Robert E. Lamb Co., Philadelphia, Pa., 843 N. 19th Street. Organized 1917. Bus. vol. C. Officers: Robert E. Lamb, President and Treasurer; John W. Halteman, Vice-president; D. M. Hunt, Secretary. Major contracts: Jeanes Hospital, Fox Chase, Philadelphia; Taylor Hospital, Ridley Park, Pa.; Arcadia Knitting Mills, Allentown, Pa.; Kaufman Plush Co., and John P. Holt factory, Philadelphia. Member: Chamber of Commerce, and A. G. C. of A.



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Worsham Brothers, Knoxville, Tenn., 201 Empire Building. Organized 1877. Bus. vol. B. This company was organized by John G. and Hugh F. Worsham in 1877. It was later operated by John G. Worsham until 1912, then by Earl S. and Fred W. Worsham until 1920. It is now operated by Earl S. Worsham, owner. Major contracts: Tennessee General building, 14 stories; Tennessee Terrace Hotel, 17 stories; First Baptist Church, \$700,000. Member: A. G. C. of A.

North-Eastern Construction Co., New York, Architects Building. Branch Offices: Lexington Building, Baltimore, Md.; Greensboro Bank & Trust Co. Building, Greensboro, N. C.; Nissen Building, Winston-Salem, N. C. Organized 1903. Bus. vol. B. This company was incorporated in New York State in 1903. Officers: D. A. Garber, President; H. R. Burt, Mason Garber, and W. M. Wolfe, Vice-president; J. B. Wolff, Treasurer. Major contracts: southern district office only—1925, Union Passenger Terminal, Winston Salem, \$600,000; 1926, Municipal Building, Winston Salem, \$500,000 and Southern Railway Underpasses, Greensboro, \$400,000; 1927, Greensboro Grade Crossing Elimination, \$1,000,000 and Winston Salem Y. M. C. A. Building, \$300,000. Member: Charter Member of the A. G. C. of A.

McGuire & Cavender, Texarkana, Tex., State Line Avenue. Organized January, 1920. Bus. vol. C. This is a partnership of John McGuire of Leavenworth, Kans., and Fred Cavender, Texarkana, Tex., who is General Manager. Major contracts: 1924, water supply for Paris, Tex., \$750,000; 1925, city concrete paving in various cities, \$300,000; 1926, 35 miles of concrete roads in Bowie Co., Tex. Member: Texas Highway and Municipal Contractors Association, a Branch of the A. G. C. of A.

Hudson & Scruggs, Inc., Wilmington, N. C., 807 Murchison Building. Branch office: 26 Virginia National Bank Building, Norfolk, Va. Organized January, 1926. Bus. vol. C. In May, 1925, R. M. Hudson and W. L. Scruggs formed a partnership for the purpose of contracting for road and street construction. Incorporated in 1926. Officers: R. M. Hudson, President; W. L. Scruggs, Vice-president and Treasurer; C. M. Symmes, Secretary. Major contracts: 1925, N. C. State projects No. 276, 376, 310; 1926, Street paving in city of Wilmington, \$300,000 and Virginia State Highway Project S-441; 1927, Virginia State Highway Project 471-A and F-134-F, also Rocky Mount Road District Project No. 1, and N. C. State Projects No. 356, 357 and 374. Member: N. C. Branch of the A. G. C. of A., and National Chamber of Commerce.

Wm. P. McDonald Construction Co., Flushing, N. Y., 67 N. Lawrence Street. Branch office: Marble Arcade Building, Lakeland, Fla. Organized April, 1911. Bus. vol. A. Officers: Wm. P. McDonald, President; John I. McDonald, Vice-president, John E. Ballenger, 2nd Vice-president; C. A. Taylor, Treasurer; James C. McDonald, Secretary. Major contracts: 1925, Hillsboro County, Fla. and Cross Bay Blvd., New York; 1926, Manatee County Contract, Fla., and Hillsboro County, Plant City District, Fla.; 1927, Coastal Highway Contract, Savannah, Ga., and Northern Blvd., New York. Member: Asphalt Association, American Road Builders Association and General Contractors Association.

Central Engineering & Construction Co., Pawtucket, R. I., 210 Main Street. Branch offices: Providence, R. I. and Cranston, R. I. Organized 1917. Bus. vol. B. This company was reorganized under new control in 1921, the company being purchased from the Estate of F. A. Sayles

by the present owners. Officers: Howard C. Fisher, President and Treasurer; Walter V. Bowen, Vice-president and Manager; Geo. R. Brown, Secretary. Major contracts: new mills for United Nets Co., Jones warehouse, Boston Rubber Shoe Co., Bird & Son Building, Putnam Light and Power Co., Omega Dam., Glenlyon Yarn Dye plant, River Spinning Co., Providence Gas Co., Brown & Sharp buildings, American Rubber Co., H. K. H. Silk Co., Commercial High School, Veazie St. School, Bodell Bankim and Office, Assumption School, Sturdy Hospital, Wrentham Hospital, R. I. State College buildings, Attleboro Bank, etc. Member: R. I. Chapter A. G. C. of A., Master Builders Association of Pawtucket, and American Construction Council.

Taylor Bros. & Co., Wichita Falls, Tex., 203-4 Brown Building. Organized February, 1925. Bus. vol. C. This company was originally organized 20 years ago as Taylor Bros., and retained that name until 1925. Officers: J. H. Taylor and C. R. Taylor. Major contracts: 1926, Parmley-Ogden Hospital, Electra, Tex., \$85,000, Fritz Motor Co. Building, Wichita Falls, \$75,000, Wichita Independent School District for the past 3 years, \$150,000 and many residences, from \$10,000 to \$75,000. Member: Texas and National Chapters of the A. G. C. of A.

M. E. Carlson, Denver, Colo., 4483 Newton Street. Organized January 1921. Bus. vol. D. Officers: M. E. Carlson, President; Kris Nielson, Superintendent of Construction; R. C. Cronen, Concrete Superintendent. Major contracts: Piggly Wiggly warehouse; 46th Avenue bridge; 13th Avenue bridge; alley paving for the city of Denver; sidewalks for the city of Denver.

E. F. Powers Construction Co., West Palm Beach Fla., 816 Harvey Building. Organized March, 1926. Bus. vol. C. Officers: E. F. Powers, President; E. M. Archibald, Vice-president; A. C. Noble, Treasurer; W. E. Keen, Secretary. Major contracts: 1927, 17 miles of pavement for Florida State Road Department, 37 miles for Palm Beach County, Fla., and 6 miles for the city of West Palm Beach, 20 miles of water pipe in West Palm Beach, 2 miles of streets in Stuart Co., and laundry in Palm Beach; 1928, 24 miles of paving for the Florida State Road Department, and 590 feet of bridges for Palm Beach County. Member: Builders Exchange of Palm Beach, Florida, Engineering Society, and American Road Builders Association.

Priester Construction Co., Davenport, Iowa, Kahl Building. Organized 1919. Bus. vol. C. This was a copartnership from 1919 to 1922, when it was incorporated. The company specializes in industrial construction. Officers: W. A. Priester, President and Treasurer; O. F. Priester, Vice-president; J. C. Tunnicliff, Secretary. Major contracts: 1924-27, industrial buildings for the Kohrs Packing Co., Davenport, Iowa, 1925, water reservoir for Quincy, Ill., 1926-27, Campbell Baking Co., Davenport. Member: Master Builders Association of Iowa, and A. G. C. of A.

Corson Construction Corp., New York, 297 Ninth Street, Brooklyn, N. Y. Organized February, 1926. Bus. vol. B. Officers: Joseph Meltzer, President; Irving L. Gelder, Vice-president and Secretary; Herman M. Bradoff, Treasurer. Major contracts: Route 8 on Section 6-E-2 14th Street Eastern Subway line, one mile long, for the Board of Transportation, New York; extension of station platforms on ten stations of the 4th Avenue B. M. T. line, Brooklyn, N. Y.; Route 109, Section 4, Smith St. subway, Brooklyn. Member: Building Trades Employers Association, and General Contractors Association.

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- 4 Heavy drive gear located at center of lead drum
- 5 Drive rollers (pinion) chilled cast wheels
- 6 Tracks spaced so they will hang in drum will revolve and follow their lead the driving end of the drive roller pinion and rollers
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- 10 No danger in use in any position
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Legal Points for Contractors

These brief abstracts of court decisions in the contracting fields may aid you in avoiding legal difficulties. Local ordinances or state laws may alter the conditions in your community. If in doubt consult your own attorney

Edited by A. L. H. Street, Attorney-at-Law

When a Contractor's Delay Released a Subcontractor

Where a sub-contractor to erect the superstructure of a building contemplated commencement of the work by the sub-contractor about May 1st, but the contractor delayed completion of necessary piling, etc., until the latter part of July, the sub-contractor was justified in declaring a cancellation of his agreement. It was so decided by the Michigan Supreme Court in the case of Interstate Construction Co. vs. Montague Brothers and United States Fidelity & Guaranty Co., 174 N. W. 173, decided October 6, 1919.

On the vital point involved the court remarks:

"The record shows conclusively that it was within the contemplation of all the parties that the work to be performed by the defendants under the sub-contractor was to commence within a reasonable time after May 1st. It further shows that defendants prepared at considerable expense to commence performance shortly after that date. A delay of nearly three months ensued, on account of plaintiff's failure to get the piling and foundation in proper shape to permit defendants to undertake the performance of their part of the contract. In the meantime labor conditions had materially changed, or would change before it would be possible for the defendant to complete. Having elected to repudiate the contract, by reason of the antecedent breach thereof by the plaintiffs, we think it was competent for defendants to show that performance thereof under the changed conditions occasioned by the unwarranted delay would have imposed upon them an extraordinary and unwarranted burden."

Rights of Members of Industrial Association

In the case of Associated General Contractors of America vs. Jopling-Marshall Construction Co., 1 S. W. (2d series) 438, decided by the Texas Court of Civil Appeals at El Paso, December 8, 1927, the court upheld the plaintiff's right to collect dues and assessments levied while defendant was a member of the plaintiff association. Defendant unsuccessfully pleaded that the plaintiff had failed to redress failure of two other members to comply with rules of the association relating to competitive bidding. The court said:

"It seems to be an individual matter with each member as to what his conduct will be. The question then is presented: Conceding a failure on the part of two members of the association to observe the conduct enjoined upon them by the code and rules in their relation to appellees [the defendant], and a failure on the part of the corporate association to correct or prevent a recurrence of the same, does such conduct and failure constitute a breach of contract, and thereby relieve appellees from their obligation to pay an assessment then due and payable? It may be that appellees did not fully and at all times complained of, realize the benefits they hoped and expected to receive from their membership in the association, but failure of consideration does not arise from disappointed hopes in the result of contracts or the motive that prompted them to become members of the association."

"There is no suggestion that appellees had not received the full benefit of whatever the association promised from the time

they became members up to and at the time the amount sued for became due and payable, and if there was a failure of consideration, the failure occurred subsequent to the time when the cause of action here had matured and become due and payable, and for that reason the failure of consideration, as found by the jury, did not affect appellant's [the association's] cause of action."

Adjusting Liability Insurance Claims

Suppose that a contractor carries a policy that indemnifies him against liability for personal injury to an employee or outsider up to \$5,000. Then suppose that a loss arises under the policy, and that the insurance company refuses an offer from the injured man to settle for \$4,000. Still further suppose that the claimant takes his case to court and comes out with a judgment for \$7,500. That means, of course, that the contractor is stuck for \$2,500 that he would not have been if the insurance company had settled the claim for \$4,000. Can the contractor hold the insurance company liable for this amount?

According to a decision handed down by the Texas Court of Appeals in the case of C. A. Stowers Furniture Co. vs. American Indemnity Co., 295 S. W. 257, the insurance company is not liable, if it acted in good faith, reasonably believing that there was a good chance of holding the claimant within the \$5,000 limit of the policy.

But in the cited case the court decided one point in favor of the insured. It was held that the insurance company in this case, in tendering to insured what it admitted to be due under the policy, had no right to make the tender conditional upon the signing of a release of all claim under the policy, and that therefore the insured, who refused to execute the release, was entitled to recover interest on the amount due under the policy, although it was later established by court decision that he was not entitled to any greater principal sum than was tendered by the insurance company.

Liability for Loss of, or Injury to, Borrowed Equipment

It is quite well settled law that when a contractor borrows or hires horses, equipment or other chattels from the owner for use on a job, he does not become an insurer that the property will be returned to the owner in uninjured condition, or at all, as against thieves, fires, accidents, etc., unless a special guaranty of safe return is made. The contractor merely becomes bound to use reasonable care to avoid losses and injuries.

In many cases it is difficult, if not impossible, to determine just what was the cause of the loss or injury. Then, the question of burden of proof becomes very important. Is it up to the owner of the property to prove that the contractor was at fault in some specific way, thereby causing the loss or injury? Or is it up to the contractor to prove that he was not at fault? Obviously, this question of burden of proof becomes very important where the owner has failed to offer any proof of cause of loss or injury, or where the testimony offered by both parties is so evenly balanced in conflict that the judge or jury can not determine what the fact is. So,

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play their part in the accuracy of Neptune-built meter main casings, even before the castings go to the machine shop for fine finishing. This accuracy is imperative, to insure the perfect fit of all interchangeable parts into every casing five, ten or twenty years later. Each casting is submitted to a searching air and water test for leakage.

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often the fate of a case rests on the question of law as to who has the burden of proof.

In the case of *Carscallen vs. Lakeside Highway District*, 260 Pac. 162, decided by the Idaho Supreme Court September 29, 1927, the court affirmed judgment that exonerated the defendant from liability for fire damage to a barge, derrick, pile driver and other equipment rented to defendant. The decision turned upon the question of burden of proof, because the cause of the fire was in doubt. The court said:

"Ordinarily, where property is injured, lost, or destroyed while in possession of a bailee [the legal term for any one who has temporary possession of chattels belonging to another], a presumption of negligence arises, making a prima facie case, and casting upon the bailee the burden of showing that the loss was due to other causes consistent with the care on his part. . . . But, when it appears that the loss or injury was caused by fire or other extraordinary intervention, the burden is upon the bailor [the owner] to prove a lack of ordinary care or violation of some specific duty by the bailee resulting in the proximate cause of the damage."

Supporting these conclusions, the court cites similar decisions by the United States Supreme Court and by the Appellate courts of Arkansas, California, Indiana, Missouri, Oklahoma and New York.

Excavations for Bridge Piers Were Insufficient

The towns of Haverhill, N. H., and Newbury, Vt., jointly contracted with a construction company to build a bridge across the Connecticut River. It was agreed that the piers should rest upon "solid ledge." Less than four years after the work was completed one of the piers collapsed, wholly wrecking the bridge. The towns sued for damages. In an opinion handed down November 1, 1927, the United States Circuit Court of Appeals, Second Circuit affirmed judgment in favor of the towns (*United Construction Co. vs. Haverhill, N. H.*, 22 Fed., 2d series, 256.)

The plans indicated that ledge would be encountered at certain elevations, but the excavation of the collapsed pier did not reach the indicated elevation. The court said:

"On the main issue we think that the towns are right; the contractor confessedly did not dig to solid ledge. That was a breach, and it was the cause of the bridge's collapse. . . . Although his engagement remained to dig to ledge, and though he was in default, he would have had an excuse, had he gone to the lines shown and found what he supposed to be ledge. Yet we cannot see what use he can make of this representation, if he did not go to the elevation shown. There was no possible warrant in the contract for supposing that what he might find at lesser depths was the ledge he was seeking. It might be, or it might not, and he must take his chances. If he failed to go to the agreed line, he had not relied upon the representation of the contract."

"Nor can we accept the contractor's argument that the specifications and plans should be construed as meaning no more than that he should dig to the solid river bed. The engineers apparently did believe, not only that the lines approximately coincided with the river bed, but also that the ledge formed that bed. Perhaps it was natural for the contractor to conclude that the bed alone was intended, and to stop there; but that was not what he undertook when he agreed that the 'excavation . . . shall be done to the line shown.'"

Other points decided by the court may be summarized as follows:

Breach of the contract was not excused by the approval of the work by the engineer or his assistant; the contract requiring approval of a board; nor because the contract provided for doing of the work to the engineer's satisfaction, which may have been expressed, since the contract further required excavation to the lines indicated on the plans.

Acceptance of the bridge and the making of final payments on the contract price did not preclude the municipalities from maintaining this suit, they being without knowledge that the work had been defectively performed.

Variations in Contract Performance Were Not Vital

A contract to install a fire prevention sprinkler system called for a 6-inch tap connection with the city water main. Replying to a contention on the part of the owner that there had been no compliance with this requirement, the Louisiana Supreme Court said in the case of *Rockwood Sprinkler Co. vs. Johnson*, 115 So. 491, decided January 18, 1928:

"The evidence shows that the city refused to permit a 6-inch tap into its water main, but did permit a 4-inch tap of the Venturi type, i. e., increasing to 6 inches within 14 inches of the main, and that this tap was over 90 per cent efficient in the amount of water which a 6-inch tap would have supplied, more than 100 per cent efficient for the number of sprinklers which it was intended to supply, and full 100 per cent efficient for the purpose for which the sprinkler system was installed, to wit, the reduction of insurance rates on the building and its contents. Moreover, the contract called for the owner to obtain the permit to tap the city main, and he was no more able to obtain that permit than was the contractor. Considering the foregoing, we do not see wherein the contractor was at fault, and we are of opinion that he has fully complied with his contract in that respect."

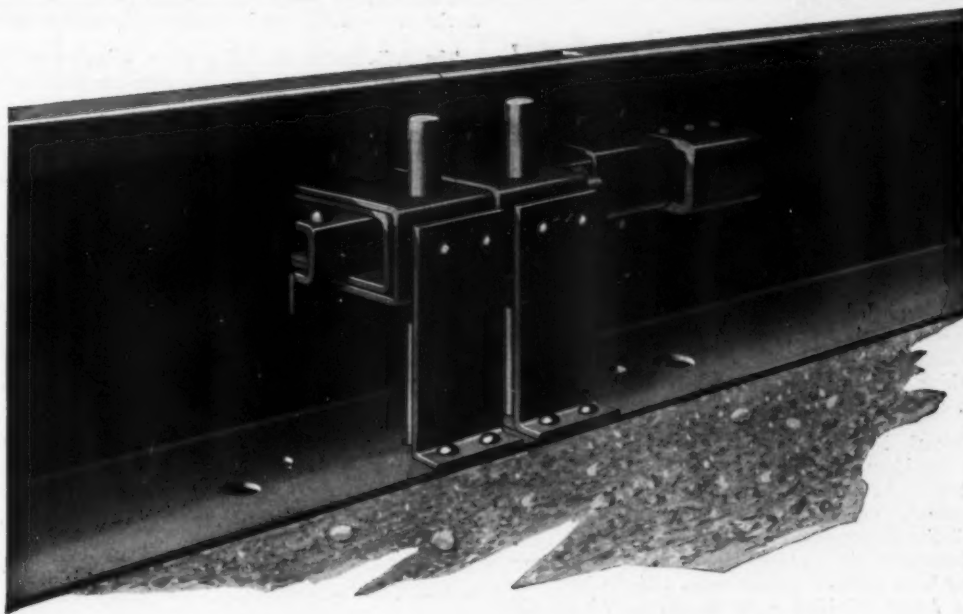
The court also decided that the owner could not hold the contractor liable in damages for changing the originally contemplated shape of the tank, thereby rendering it less suitable for displaying advertising, since such use of the tank was not within the contemplation of the parties when the contract was entered into.

General Contractor Was Liable for Injury Done by a Subcontractor in Blasting

An Indiana highway contractor sublet to one Gist the work of bringing a road to grade preparatory to laying concrete. This necessitated considerable blasting, and in doing that work Gist's employes caused much damage to Mrs. Cobb's adjacent property. They extended borrow pits upon her land beyond the limits authorized by a contract between her and the general contractor. More than 1000 tons of stone was cast upon her land. Two of her cows were killed and flying stones seriously damaged her buildings 500 feet away from the blasting site. Holding that the general contractor was liable jointly with the subcontractor for these injuries, the Appellate Court of Indiana said in the case of *Scott Construction Co. vs. Cobb*, 159 N. E. 763, decided January 26, 1928.

"The general rule is that one person is not liable for the acts or negligence of another person, unless the relation of master and servant exists between them; and that, where an injury has been done by a party exercising an independent employment, the person employing him will not be liable in damages for injury or death resulting from the wrongful acts or omissions of such person, or the servants of such party."

"But there are many exceptions to this rule. It does not apply in the following cases: (1) Where the contract requires the performance of work intrinsically dangerous; (2) where a party is by law or contract charged with a specific duty; (3) where the act will create a nuisance; (4) where the act to be performed will probably cause injury to others unless due precaution is taken to avoid harm; and (5) where the act to be performed is illegal. The work in the instant case clearly comes within the fourth exception."



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Construction Industry News

The National Paving Brick Manufacturers Association, 342 South Michigan Avenue, Chicago, Ill., has announced the appointment of Quincy A. Campbell as Acting Secretary and Assistant to the Managing Director of the Association. Mr. Campbell has been with the Ohio Department of Highways since 1921 and in 1927 became Assistant Chief Engineer of Maintenance with headquarters at the Columbus office, which position he resigned to enter his present employment.

The Universal Portland Cement Co., Chicago, Ill., through its President, B. F. Affleck, has announced the appointment of F. L. Stone as General Sales Manager. He succeeds Blaine S. Smith, who recently resigned to become President of the Pennsylvania-Dixie Cement Corp. Mr. Stone has been with the Universal Company for eighteen years, having been successively salesman, Chief Clerk, Assistant Sales Agent, Division Sales Manager, and for the last ten years Assistant General Sales Manager.

The Construction Machinery Co., Waterloo, Iowa, and the Marsh-Capron Co., Chicago, Ill., have announced the merger of these two well-known manufacturers of concrete and construction machinery. The amalgamation has been effected for the purpose of bringing about the economies of common management. Both lines of equipment and the long established sales and service policies of both companies will be continued. The merger is now in effect, and the business is being conducted under the name of the Construction Machinery Co.

The Paint and Varnish Division of E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., has announced the perfection of a radically new method of manufacturing asphalt paint by mechanical emulsification of asphalt and water and the addition of chromium salts. The material is intended for the same general purposes as melted or asphalt paint for the protection of iron and steel and as a wood preservative. The chromium salts are introduced as a rust inhibitor. The asphalt chromate emulsion is applied cold by spraying, or with a brush. The absence of volatile solvents and cut-back ingredients serves both to retain all the essential properties of pure asphalt and to make use of the new compound safe in confined spaces, there being given off no noxious fumes nor explosive vapors.

The G. H. Williams Co., Erie, Pa., has appointed Carl F. Weiblen, formerly manager at the Cleveland office, Chicago manager. Mr. Weiblen replaces R. B. Randall, who is taking over the position of Pacific Coast manager for the Link-Belt Co., with headquarters in San Francisco.

The H. K. Ferguson Co., Hanna Bldg., Cleveland, Ohio, has announced the promotion of R. E. J. Summers from chief contracting engineer to Vice-President in Charge of Contracts. The officers of the company, in addition to Mr. Summers, are Harold K. Ferguson, President and Treasurer; Joseph S. Ruble, Vice-President and Construction Manager, and H. S. Jacoby, Secretary and Chief Engineer.

The Jaeger Machine Co., Columbus, Ohio, has announced that the French Government has just purchased 85 Jaeger mixers, 50 being of the 14-S $\frac{1}{2}$ -yard size equipped with extension track loaders. The previous week an order for

two carloads of Jaeger mixers had been received from the Soviet Government for immediate shipment to Russia.

The T. L. Smith Co., Milwaukee, Wis., manufacturers of concrete mixers and pavers, has announced the appointment of A. J. Gerlach as Advertising Manager, responsible for the preparation of advertising literature, cooperating with George J. Kirkgasser Co., of Chicago. Mr. Gerlach was formerly advertising manager of the Sterling Motor Truck Company.

The Stone & Webster Engineering Corp., has been formed with a capitalization of \$9,500,000, and has taken over from Stone & Webster, Inc., New York, Boston and Chicago, its construction and engineering business and its interest in Ulen and Company. It has also acquired from the North American Company its engineering and construction company known as McClellan & Junkersfeld, Inc. G. O. Muhlfield is President of the new company.

The Sullivan Machinery Co., 162 South Michigan Ave., Chicago, Ill., has announced the appointment of the following distributors for the sale of Sullivan pneumatic equipment: United Hoisting Co., 136th St. and Locust Ave., New York; Eastern Metal & Iron Co., Salt Lake City, Utah; Standard Equipment & Supply Co., M. J. Paul, Mgr., Sacramento, Calif.

The Rail Steel Bar Association, Builders Building, Chicago, Ill., has announced the release of a three-reel educational film "The Story of Rail Steel," which may be reserved for exhibition without charge by technical societies, civic organizations, contractors and similar groups, by addressing the Association. The picture shows the manufacture of concrete reinforcement bars portraying each consecutive operation from the refining of pig iron to the final use of the bars in reinforced concrete construction.

Cleaning Up Shale and Rock from a Small Stream

ONLY a few weeks ago M. E. Moran of Groton, N. Y., was called upon to straighten and clean out the bed of a stream near Spencer, N. Y., to permit its carrying away a larger amount of water at a faster rate during flood periods. The accompanying illustration shows a 1928 Model Bay City tractor shovel which tackled the tough digging successfully in spite of all difficulties. Mr. Moran reports that the small machine accomplished its work admirably in spite of the fact that for several hours at a time on different sections the machine was obliged to operate with the fast running water completely covering the crawlers and main frame.



Bay City Tractor Shovel Operating in a Stream Bed Near Spencer, N. Y.

Reducing FIRST costs as well as *last* costs with CAST IRON PIPE



(above)
*An inexpensive crane for
placing pipe in position*

(at the left)
*Unloading 24" cast iron
pipe using skids*



*Much helpful data for the engineer
and contractor is contained in the
U. S. Cast Iron Pipe Hand book.
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FIRST cost is usually the last cost with cast iron pipe... And proper handling methods will not only insure a lasting job, but also materially reduce the first cost of installation.

The illustration above shows the simple equipment necessary for handling efficiently medium-sized cast iron pipe. The use of the inexpensive crane illustrated speeds up the work, reduces labor cost and helps to make a better finished job.

Practical experience indicates that the use of labor-saving devices may save as much as 40% of the cost of laying mains with hand labor alone. Skillful handling and good equipment on the job always pay.

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New York: 71 Broadway

San Francisco: 3rd & Market Sts.
Pittsburgh: 6th & Smithfield Sts.
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Kansas City: 13th & Locust Sts.
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The New Insley Type R Full-Revolving Excavator

A Full-Revolving Excavator

A NEW full-revolving excavator, Type R, with five attachments, has been developed by the Insley Manufacturing Co., Indianapolis, Ind. The shovel, ditcher, skimmer, crane and dragline are interchangeable, and the unit has many features of advanced design.

Roller bearings for all shafts above the revolving frame, cut gears throughout, cast steel carbody, cast steel machinery base and side frames, separate control for each crawler, and one shot lubrication for crawler rollers are features. A special feature is the use of hydraulic brakes which operate separately on each crawler, and which are controlled from the operator's platform. These brakes operate as effectively in one direction as in the other, eliminating the necessity of dogs or chocks. Power can be applied to each crawler separately from the operator's platform.

Swinging at the rate of 5 r.p.m., combined with the line speed, gives exceptionally fast operation. It has a tail swing of only 7 feet. The shovel uses the Insley patented cable crowd. The standard shovel boom is 17 feet 6 inches long, giving a dumping clearance of 12 feet 6 inches, or the shovel can be equipped with a high lift boom and dipper for any clearance up to 15 or 16 feet. It has a gear-driven boom hoist which is self-locking without the use of brakes or dogs.

The ditcher uses the same boom as the shovel, and has an effective digging depth of 18 feet. The skimmer has a digging radius of 20 feet 6 inches from the center of rotation, a dumping clearance of 10 feet and carries a bucket with $\frac{1}{2}$ -yard working capacity. The crane has a 35-foot boom as standard equipment, and can be equipped with a longer boom if necessary. Its capacity is 5,200 pounds at 18-foot radius, 4,500 pounds at 20-foot radius and 2,500 pounds at 30 feet. It has more than ample capacity to handle a $\frac{1}{2}$ -yard clam-shell. The power boom hoist can be raised and lowered under a load on crane work. The dragline uses the same boom as the crane and a bucket having a $\frac{1}{2}$ -yard working capacity.

A New Crawler Crane

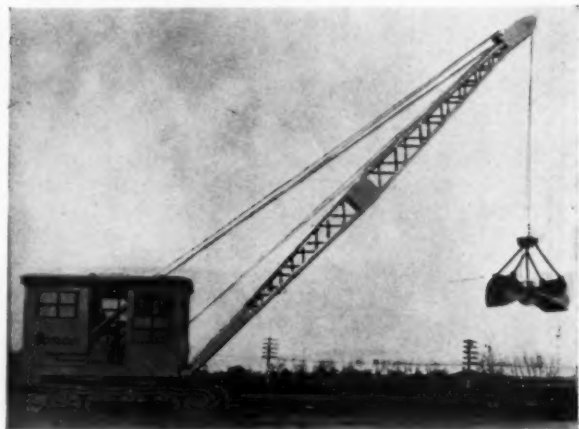
A NEW crawler crane has recently been put on the market by H. D. Conkey & Co., Mendota, Ill. This is known as the Conco crawler, and is gasoline or electric operated. The outstanding features of the new product are the low center of gravity and consequent stability, ease of operation and speed, simplicity of operation, ruggedness of construction, low power loss, absence of friction clutches and low maintenance cost.

The crane is self-contained, full-circle and designed to run a rapid material handling unit for grab bucket, dragline bucket and hook block work. Strictly a one-man crane, it is operated from the operator's deck near the front end of the cab for such functions as hoisting, raising and lowering of boom, swinging, traveling, and steering.

Special attention has been given to the matter of convenience and ease of operating all crane functions. Vertical swing and travel shaft bearings are oiled by large oil cups, conveniently located in the cab. The Alemite system of lubrication is used where oil cups cannot be attached.

The traveling gear is arranged for two speeds under control of the operator regardless of the position of the turntable. The swing brake is of such design that the turntable or machinery deck may be set in any position with relation to the car body.

A special feature of the crane is the method of engaging the hoisting and holding drums. A heavy ball thrust bearing in



The New Conco Crawler Crane

connection with a special thrust nut provides a highly effective means of operation and eliminates all thrust screws, washers, springs, cams, etc. This feature is an exclusive patent on the Conco machine and it brings about a smoothness of operation with an increased working capacity at low maintenance. The crawler cranes are at present built in $\frac{1}{2}$ -, $\frac{3}{4}$ -, and 1-yard capacities.

Two Well-Known Mid-Western Distributors



A. A. Fuchs, Pres., Fuchs Equipment Co., Omaha, Nebr.



C. H. Jones, C. H. Jones Company, Salt Lake City, Utah

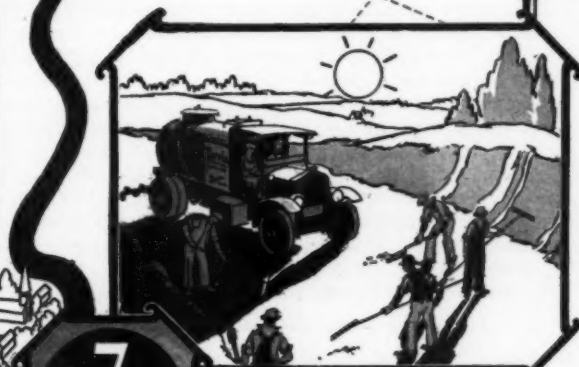
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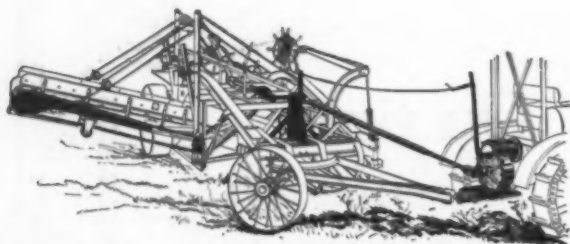
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A New Drive Speeds Elevating Grader

RUGGEDNESS, high quality of material and workmanship, and efficiency are features of the new power take-off of The Austin-Western Road Machinery Co., 400 No. Michigan Avenue, Chicago, Ill. This is a device by means of which the carrier of the Austin "Contractor's Special" New Era elevating grader is driven directly from the engine of the Caterpillar Sixty tractor, not being dependent for its power on the traction of the rear wheel of the grader.

According to the manufacturer, the new device saves labor, time and money. It has the following advantages: a faster moving belt giving greater capacity; a constant, uniform belt speed, irrespective of the movement of the grader as a whole, insuring no delay in delivering dirt; a positive drive irrespective of the load put upon the carrier by the plow, no clogging, and a uniform delivery of dirt; the opportunity to work the plow to its full capacity, greatly increasing the capacity of the grader; and the ability to start work much sooner after a rain than when the carrier gets its power from the rear wheel. A big saving in gasoline is afforded, and wear and tear on the tractor is reduced to a minimum by reason of the decreased load the tractor has to pull. A saving in repairs is also afforded by the elimination of wear on the drive wheel, short shaft, gears and other driving mechanism between the rear wheel and the carrier.



The Austin "Contractor's Special" New Era Elevating Grader With the Caterpillar Sixty Tractor and New Austin Power Take-off

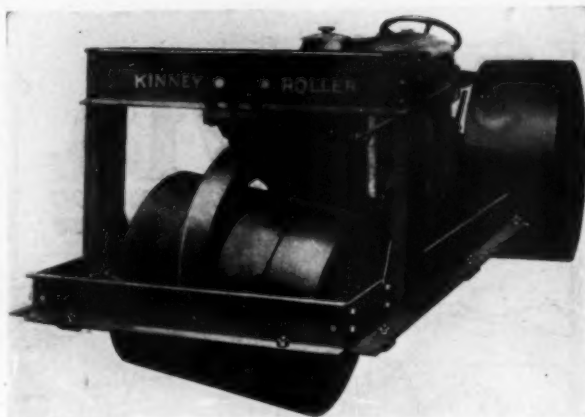
Road Roller and Tractor in One

A ROAD roller that is sold or leased and is exceptionally rugged, flexible and useful for ground conditions that are rough and hard, or soft and treacherous, has been developed by Kinney Standards, Inc., 191 Clifton Place, Brooklyn, N. Y. The unit is built in capacities of 2, 3, 4, 5 and 6 tons. It is especially useful for compacting foundations, subgrades and embankments, or for making rough surfaces approximately even. The rolls have plain forged steel rims adapted for rough work. Scarifier, planer, and crane attachments are available.

The maximum height of the standard roller is about 52 inches, length 12 feet, wheelbase 8 feet, roll path 61 inches; front roll 28 inches in diameter, 32 inches wide; overlapping rear rolls each 42 inches in diameter, 16 inches wide. Detachable double acting roll scrapers come with the Roadroller.

The structural steel roller frame clamps to the regular Fordson body and is readily removable. There are no holes to drill. The net Fordson body weighs 1615 pounds. The balance of the roller weight is in the roller equipment, practically all of which is steel and unbreakable. All bolts and fittings are standards and extra strong.

The tractor rear hitch is always available. A special feature of the roller frame is the sturdy front bumper with couplers for handling forward loads. For the operation of an



The Kinney 2-3-Ton Fordson Roller

independent scarifier or other drag equipment requiring maximum traction, roller traction cleats are added to the standard rear rolls as needed. The roller thus becomes a tractor that safely pulls maximum Fordson loads with the greatest ease, speed and economy.

Several types of rollers are available. Some have detachable reinforcing compartments and weight on the roller frame. This reinforcement affects all the rolls evenly, and all or part is easily removable and replaceable.

Kinney rollers include one front roll and two rear rolls. Rolling effects depend on the roller weight and its location. The rear rolls may contain balanced weight cemented in or otherwise secured.

The front roll contains four wheels side by side, each wheel 8 inches wide with roller bearing on a polished axle for ease in turning. The ends of the axle are supported in the heavy forged girdle that surrounds the roll. The front and rear of the girdle are horizontally pivoted in a bearing at each lower end of the annealed steel steering fork that curves fore and aft over the center of the roll. These pivots are as low as the axle and at right angles to it, so that the roll conforms flexibly to very uneven ground surfaces with minimum displacement of machinery and with little resistance to steering. The roller steers easily from the regular tractor steering wheel. The vertical king pin at the top of the fork is 3 inches in diameter, of chrome nickel steel with steel bearing.



A Trackson McCormick-Deering Model DH With North Digger Climbing a Dump Heap With a Full Load of Dirt

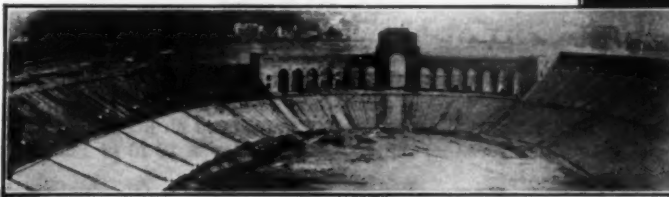
A few of the ways in which engineers use Carey Elastite Expansion Joint to protect concrete construction work, and to prevent expansion and contraction over-stresses...



A stretch of concrete roadway between Nashville and Murfreesboro, Tennessee, lastingly protected by Carey Elastite Expansion Joint, properly installed at intervals of forty feet.



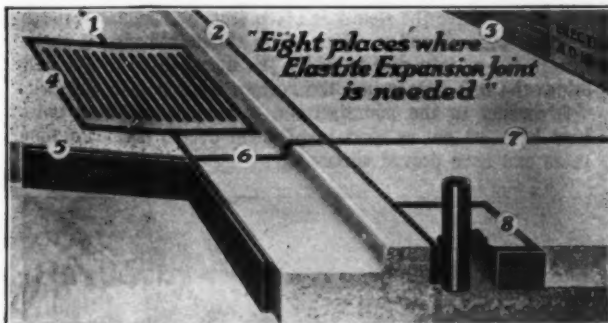
The 1200-ft. Conneaut Viaduct, on the Cleveland-Buffalo Road, Ashtabula County, Ohio. Carey Elastite Expansion Joints were used on both sides of the railing posts.



For the stadium and grandstand . . . The Coliseum, Exposition Park, Los Angeles, California, protected against over-stresses by Carey Elastite Expansion Joint.



Carey Elastite Expansion Joint is used extensively to protect swimming pools, reservoirs, dams and retaining walls.



Carey Elastite Expansion Joint is used here in eight places—between the pavement and the curb, between the sidewalk and the curb, between the sidewalk and the building, around sewer openings and manholes, transversely in the pavement at 30-ft. intervals, transversely in the curb, transversely in the sidewalk, around all posts and obstructions.

Carey Elastite
EXPANSION JOINT

is made of the best and most carefully selected materials—fibrous asphalt, permanently pressured between two layers of asphalt-saturated felt. It meets any expansion joint specifications, anywhere, and it lasts as long as the concrete it protects. Write for particulars about modern methods of expansion joint installation.

THE PHILIP CAREY COMPANY, Lockland, CINCINNATI, OHIO

Strength in a New Elevating Grader

STRENGTH is the outstanding feature in the new "Contractor's Special" elevating grader of The Austin-Western Road Machinery Co., 400 No. Michigan Avenue, Chicago, Ill. All of the features of the New Era graders of this manufacturer are incorporated in this new model, as well as several unique features that adapt it to use behind the most powerful crawler-type tractors.

The frame is constructed of heavy "H" beam side rails, weighing 24 pounds per foot. The fifth wheel is made of $\frac{1}{2}$ x 4 x 4 "T" iron, reinforced by four 6-inch cross channels; the front axle is 2 7/16-inch round cold rolled steel and the rear axle is 2 15/16-inch round steel.



The New Austin Contractor's Special Elevating Grader Loading a Western 7-Yard Dump Wagon in the Gary, Ind., Sand Dunes

All wheels are of the double hot-riveted type, the spokes being riveted into a cast steel hub and also into the rim, the ends being countersunk on the outside to prevent their wearing off.

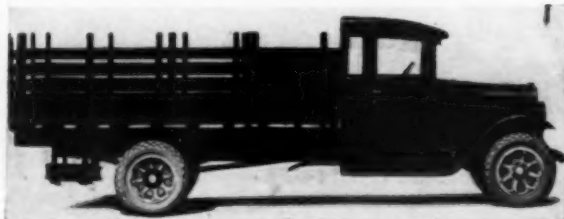
The carrier regularly furnished is the Austin 36-inch, but a 42-inch carrier is furnished if desired. The automatic spiral pan cleaning device is regular equipment. A stationary disc plow is also standard, while either a revolving disc or moldboard plow is furnished if wanted.

The Austin power take-off, a device by means of which the carrier of the "Contractor's Special" is driven directly from the engine of the traction power, not being dependent for its power upon the traction of the rear wheel of the grader, is not regular equipment with this new model, but is strongly recommended by the manufacturers, as it increases capacity, saves wear and tear on both grader and tractor, and makes it possible to work when the ground is too wet to permit using graders not fitted with the power take-off.

A 6-Cylinder 1 3/4 -Ton Truck

INCREASED power and flexibility and the greater operating safety provided by the new 6-cylinder power plant, 11-inch single plate clutch, 4-speed heavy-duty truck transmission and Lockheed hydraulic internal expanding brakes operating in 16-inch drums in all four wheels, are the features of the new truck of Graham Brothers, the truck manufacturing division of Dodge Brothers, Inc., Detroit, Mich.

The new 6-cylinder engine has a bore and stroke of $3\frac{3}{8}$ x $3\frac{7}{8}$ inches and displacement of 207.99 cubic inches. The crankshaft is machined all over and is supported on seven main



A 1 3/4-Ton Graham Truck with Stake Body

bearings having a combined projected area of 24.15 square inches.

A temperature indicator is provided in the instrument panel and a thermostat automatically controls the temperature of the cooling water in the cylinder jackets radiator shutter, making it possible for the driver to warm the engine up more quickly and to keep the engine warm when the truck is left standing. Both are said to contribute to the high mileage obtained from the fuel.

The new 1 3/4-ton chassis is available in two wheel bases; 150-inch for bodies with a 10-foot loading space and 165 inches for bodies with a 12-foot loading space. The cab has been designed to afford greater comfort and better vision. The seat backs are of sedan construction and both back and seat cushions are deeper and more comfortable. The corner posts are of steel to provide slenderness and strength and the windshield is of one-piece construction and equipped with an automatic wiper.

This model is one of the complete line of 6-cylinder trucks recently announced. The capacities range from $\frac{1}{2}$ to $2\frac{1}{2}$ tons and bodies are offered to supply almost every conceivable hauling need.

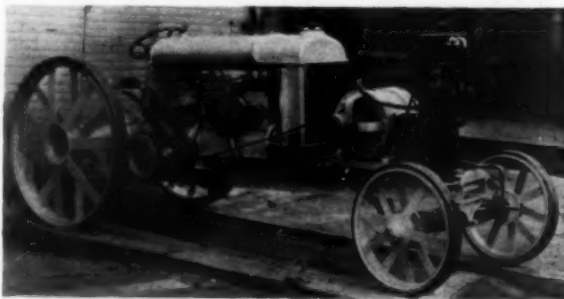
A New Mounting for Arc Welders

A NEW mounting of the standard Lincoln Electric Stable-Arc welder has been announced by the Pontiac Tractor Co., 44-52 W. Lawrence, Pontiac, Mich. The welder unit with stabilizer and panel are mounted on a frame, which attaches to either the Mc-Cormick-Deering 10-20 or Fordson tractors.

This mounting of the Pontiac Lincoln arc welder gives a 4-wheel rubber-tired self-propelled unit, capable of hauling heavy loads behind itself. This unit is also mounted on crawlers for soft ground work.

Power to drive the welder is taken from the tractor through a power take-off pulley, which has a clutch, allowing it to be thrown out or into gear at will. The ahead drive of the belt brings the belt tighter into the correct relation with the belt.

According to the manufacturer, a number of these units have been put out as special equipment over a period of four years and have proved successful.



The New Mounting of the Standard Pontiac Lincoln Electric Stable Arc Welder



Wisconsin State Highway No. 12
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Standard Asphalt Road Oil No. 4 and gravel
applied by the turnover method

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Milwaukee
Green Bay

208

A Removable Body for Hand Trucks

ON many concrete highway projects where cement bags are handled from freight cars to platforms and there stacked in piles to be loaded on the trucks with batch boxes, hand trucks are employed to move the bags. A removable body for hand trucks has been developed by the Re-Bo Co., Inc., 45 White Memorial Building, Syracuse, N. Y., which transforms the handling of bagged cement into a system that materially speeds up work.

The Re-Bo Model B removable body has a base 28 x 25 inches, and the upright section is 28 x 42 inches. It weighs 65 pounds and has a carrying capacity of 1,200 pounds. The frame is made of special angle steel reinforced by patented steel supports projecting to the rear. Steel plates at the top and the

bottom protect the loading frame from the hand truck. A steel handle fixed to the top plate makes it easy to pull the Re-Bo Body onto the hand truck.

When the removable body is loaded with bags of cement, the lip of the truck slips under the lower platform and the body is pulled back onto the truck. The loading surface is of selected hard



The Re-Bo Body for Hand Trucks

wood lumber, and is unobstructed and absolutely even. The reinforcement at the angle between the base and the upright portion of the truck acts as fulcrums under which the lip of the truck is slipped, allowing the removable body to be easily tipped back into place on the hand truck.

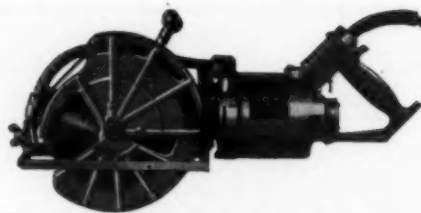
An All-Purpose Electric Saw

THE Super Porto electric saw, according to the manufacturer, the Portable Power Tool Co., 2634 So. Dearborn Street, Chicago, Ill., is built to do 96 per cent of all the cutting on any job. It cuts at any angle and any depth from 1/16 inch to a full 2 5/8 inches. It cuts 3-inch dressed lumber, and will cross or rip or plane.

One of the outstanding features of this saw is its safety, without clumsiness. The top safety guard gives complete coverage and protection no matter what style of blade is in use. The lower safety guard is a new and ingenious design that insures perfect safety. Whether cutting or idling, the saw blade is always enclosed. This is completely automatic, and is practical and operative in cuts of any description, including bevel cuts.

Depth adjustment is made in a second. The saw can be set for any desired depth, and when the adjustment is made the balance is the same as before. The foot base of the saw is always parallel to the axis of the blade in relation to the work. The saw is rugged, and sturdy, and built for hard, continuous, satisfactory service.

A clear vision blower enables the operator at all times to have a clear vision of his pencil line markings without wast-



The Super Porto Electric Hand Saw

ing time dusting off sawdust by hand. A patent beveling device makes possible exact bevel cuts to any angle from 0 to 45 degrees. Standard combination rip and crosscut blades are furnished.

The E-Z grip front handle is a novel swivel jointed design which conforms at all times to the operator's natural hand and arm position. A cleaning and cooling fan, mounted on the shaft in front of the motor, keeps the motor cool and clean. A comfort safety switch is the momentary contact type and designed for the operator's comfort as well as safety. Fifteen feet of 16-gage rubber covered cable, impervious to water, oil and acid, is furnished. The old style design operating handle follows the hand saw handle design exactly, enabling the operator to use the position and grip to which he has been accustomed.

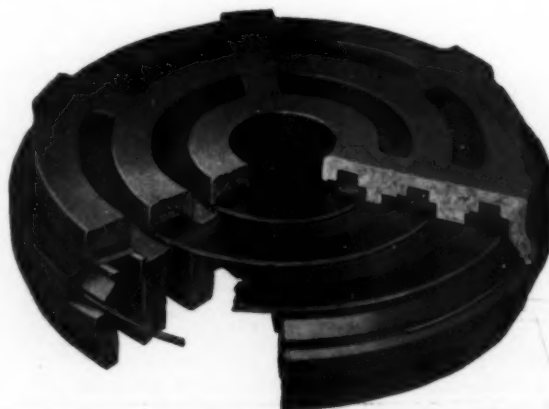
Power is supplied by a Universal motor, operating on either DC or AC, 60 cycles or less, from any light socket. It is available in 110, 220, or 250 voltage.

An Improved Air Cushioned Air Compressor Valve

SIMPLICITY of construction which combines the utmost of durability and efficiency with the greatest element of safety are the chief features of the Pennsylvania improved air compressor valve of the Pennsylvania Pump & Compressor Co., Easton, Pa.

An important feature of the valve is the air cushion pocket in the guard. As the valve opens, instead of striking the guard, the discs enter this air pocket and the air trapped in the pocket provides a cushion which prevents the valve from striking the metal of the guard. This air cushion is an exclusive feature, adding to the life of the valve and its quietness of action.

The valve assembly is held together by means of a retaining ring which engages the valve guard and seat. The greatest factor of safety has been provided for, as there are no bolts, screws or nuts used in the construction of the unit, thus eliminating the possibility of any part becoming loose and falling into the cylinder, to do damage to the compressor.



The Improved Air Cushioned Air Compressor Valve

CHLORINATION SAVED \$125,000

Vol. 100
ENGINEERING NEWS-RECORD
No. 36

Other Papers on Chlorination
Algae Control at Kansas City, Kan., L. B. Mangum,
Chemist in Charge of Water Purification, Kansas City, Kan.
—Chlorination three times a week of the influent to a 13-
m.-g. storage reservoir sufficient to give residual chlorine in
the entire reservoir within ten hours gave such satisfactory
results during the summer of 1927 that a proposed outlay of
\$125,000 to cover the reservoir is now deemed unnecessary.

And Eliminated ALGAE in the WATER SUPPLY

It is well known that Chlorine destroys and prevents algae—those objectionable taste and odor producing plants which grow in such profusion in open reservoirs in the summer, and which multiply so quickly in well waters when exposed to the sunlight. But it is seldom that a more striking illustration of its value has been found than at Kansas City, Kansas.

There chlorine was such a successful algacide that it eliminated the necessity of spending \$125,000 to cover a reservoir.

And chlorine sterilizes the water as it eliminates trouble from algae growths!

Here—as in all other branches of chlorination—the trained personnel of Wallace & Tiernan can offer many valuable suggestions.

The vacuum principle of control is exclusive with W & T Chlorinators. The operation is completely visible. Chlorine comes in contact only with silver, glass and rubber. The first Vacuum Chlorinator was shipped in 1921. It is still operating and so are all of the other two thousand shipped since then. Long life is characteristic of W & T equipment.



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SA 11



The Brookville 12-Ton Model "IBU" Hauling a 90-Ton Load Up a 2½ to 3 Per Cent Grade

Industrial Locomotives Have Wide Use

A 12-ton locomotive, Model IBU, with a 15-30 McCormick-Deering Industrial power unit, is being produced by the Brookville Locomotive Co., Brookville, Pa. The hauling capacity is 4,800 pounds at the draw bar. The industrial tractor is used intact other than discarding wheels, front axle assembly, and other small fittings.

The frame of the locomotive is of heavy ship channel. The end sills are heavy castings, and the couplers are standard MCB, with link or pin optional. The lower driving axle is 4-inch steel, and the journal boxes are cast steel, with bronze bearings. A dual system of brakes is used: cast iron on all four drives, and standard McCormick-Deering emergency. Four sanders, two for forward, and two for reverse work, are used. There is positive drive on all four drivers, the McCormick-Deering axles are merely used to transmit power to the lower shafts.

There are three speeds forward and three reverse; standard being 2, 4 and 10 miles per hour, or 1½, 3 and 7½ miles. There is no change to the McCormick-Deering transmission. The Brookville reverse mechanism gives standard tractor speeds in both forward and reverse work.

The drive wheels are 33 inches in diameter, with 4-inch chilled face, and 1½-inch flange. The wheel base is 60 inches. The cab is all steel, full length, with or without curtains.

These locomotives are particularly useful in limestone, marble and granite quarries, cement and sand quarries, road construction, general contracting and construction.

An All Steel Dump Body

A FEATURE of the new line of dump body equipment of The Galion Allsteel Body Co., Box 15, Galion, Ohio, is the roll-back of 21 inches on the body subframe before the load is finally dumped, thus permitting easier and quicker dumping. Another feature is the automatic roller lock, which securely holds at all dumping angles.

This hand hoist dump body has been designed for all truck chassis. Speed is a feature of the unit, as 12 to 17 turns of the crank handle dump the load. A 69 to 1 gear ratio permits greater speed. High speed is permitted because the weight of the load is not lifted by the hoist, but rather as the crank handle is turned, the body rolls back, thereby relieving the hoist of the usual dead weight.

The roll-back feature relieves the operator of unnecessary physical exertion. The unit is of simple construction with perfect fitting parts, assuring smooth and noiseless operation. The automatic roller lock is noiseless, easy working, and simple operating. The crank handle is permanently affixed to the crank shaft and is controlled.

The roll-back also eases up the dumping shock, thereby relieving the chassis of the usual stresses and strains. The center of the load rides from 3 to 17 inches ahead of the rear axle, depending on the wheelbase of the truck, and the roll-back of 20 inches eliminates cutting off the rear end of the frame unduly.

Steel pins pass through the hoist gear shafts, keying them in permanent position. Excessive strains on the hoist while the body is in running position are overcome by means of the positive lock at the front of the body. The hoist is protected from damage by the roll-back mechanism when dumping the load. Oil cups are provided at bearing surfaces for lubrication. The track in which the rollers ride in carrying the body when dumping is inclined, thereby easing up the action as well as preventing excessive wear on the roller.

Bronze bushings are used in the four rollers that carry the body. A high ground clearance of 22 to 25 inches is permitted. Very little counterweight is required, and what is used is built in the body. The hoist gears are heavy castings made from machine-cut tooth patterns.

The body is strongly built. It is reinforced by angle and channel iron so that it will stand abuse. The tailgate is reinforced with heavy channel iron which passes through the center of the gate.



The Galion Allsteel 1½-Yard Hand Hoist Dump Body for Reo Trucks

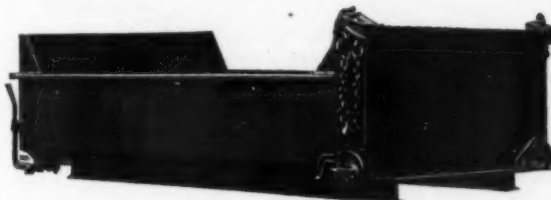
Wood Steel Dump Bodies

Since the Dump Body contains the Pay Load the ability of the entire dumping unit for economical performance, long service and profitable operation depends upon it.

The Wood line of ALL-STEEL Bodies is complete. It includes the correct type and capacity for every purpose and requirement.



W-12 is a heavy duty body for excavating work and severe service.



W-8 is a very popular, rugged type for general dumping requirements.



H-1 has removable sides. It is quickly convertible into platform body for general purposes—practically two bodies in one.

WOOD HOISTS-BODIES

Wood Dumping Equipment serves industry everywhere building is in progress, everywhere good roads are being built, everywhere material is hauled and dumped.

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Wood Hydraulic Hoist & Body Co.
Detroit, U. S. A.

Water

*the least of
your troubles
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BARNES PUMPS



HUNDREDS of contractors have eliminated all worry about water supply. Rugged Barnes Triples Road Pumps are furnishing a steady supply of water for all operations on various road building projects throughout the country. You, too, can turn the water supply "bug-bear" into a negligible item.

Check the features below and send the coupon for complete specifications and data.

- 1—Most simple, self-oiling system—one moving part rotary pump.
- 2—All steel gears.
- 3—Forged crank shaft—not cast.
- 4—Three point suspension truck, spring mounted.
- 5—Roller bearings on all shafts, including crank shaft.
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- 7—Flexible coupling between pump and engine.
- 8—Rubber-tired roller bearing wheels, interchangeable with standard steel wheels.

THE BARNES MANUFACTURING CO.
905 Main St., Mansfield, Ohio

The Barnes Manufacturing Company,
905 Main St., Mansfield, Ohio

Please send me complete information about Barnes Triples Road Pumps.

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The Link-Belt Model K-55 Equipped as a Dragline

A New 2-Yard Shovel

THE addition of a full 2-yard capacity machine to the line of crawler cranes, shovels and draglines of the Link-Belt Co., 300 West Pershing Road, Chicago, Ill., has been announced. This new machine, the K-55, is a powerful, heavy-duty all-purpose unit, primarily designed for the following adaptations: shovel with 30-foot boom and 18-foot dipper stick carrying a 2-yard struck-measure-capacity all-manganese-steel dipper; dragline to handle 2-yard dragline bucket, for medium and medium-heavy excavating, on a boom 50 feet long, or a 1½-yard dragline bucket on a boom 60 feet long; clamshell bucket of 2-yard capacity, for sand, gravel or materials of equal weight per cubic foot and consistency on a boom 50 feet long, or a 1½-yard bucket in such materials on a boom 60 feet long, or an equivalent weight of loaded bucket in heavier or lighter materials; trench shovel of 2-yard capacity. All attachments are interchangeable without removing or disturbing the mechanism of the machine proper.

The special clearance reducing arrangement of this machine contributes to making it a particularly convenient one for the contractor by making it possible to ship it from place to place without dismantling, thus saving time and money every time the machine is shipped to a job. The K-55 has a collapsible mast, and special shipping treads which may be quickly and easily substituted for the working treads, to bring the machine within the railroad clearance requirements.

Besides the unit cast steel construction of lower and upper frames, the machine has self-cleaning crawler treads and large bronze-bushed crawler rollers, enclosed cut gearing and bronze-bushed bearings throughout and internal expanding friction clutches. The main drum clutches are 42 inches in diameter; and the swing and travel clutches 30 inches in diameter.

A 13½-inch diameter center pin, adjustable from above, can be removed as a unit with the vertical travel shaft assembly, without removing any other parts. Large drums with renewable cast steel shells, having air space between clutch and brake surfaces, for rapid cooling, and large, powerful

drum brakes, 48 inches in diameter by 5 inches wide, are other features.

The machine in working condition is 12 feet wide overall at the lower frame, which gives it ample stability for the work for which it is designed. The crawler treads are 36 inches wide. The K-55 is built to be driven with gasoline engine, electric motor or diesel engine drive.

A New Air Dump Car

AN all-steel, 100,000-pound, 30-cubic yard automatic rolling trunnion air dump car, especially suited for handling stone and sand, has been developed by the Koppel Industrial Car and Equipment Co., Koppel, Pa.

The car weighs 66,000 pounds and has a length inside of the body at the top of 34 feet and width of 9 feet 3 inches. The length inside at the bottom is 32 feet 4 inches and the width 8 feet 10½ inches; and the depth inside of the body is 2 feet 8½ inches. The length over the striking plates in 38 feet 4 inches, the over-all width 10 feet 4½ inches, and the height 7 feet 9 5/16 inches. The dumping angle of the body is 45 degrees, the wheels are 33-inch ARA chilled iron, the axles 5½-inch and 10-inch ARA chilled iron, the axles 5½-inch and 10-inch ARA and the gage is 4 feet 8½ inches.

A feature of the design is that the entire weight of the car body and lading is carried in stable equilibrium directly on the center sills without the use of trunnions. This is accomplished by rolling diaphragms built into the bolster construction located centrally on the truck centers and by four rolling diaphragms, one located at each cross bearer supporting the air cylinders.

The direct bearing surface between the body and under-frame members extends 25 inches on either side of the center of the car, and when air is applied in the lifting cylinders the car body rolls from a point 25 inches from the center until the upper stops at the end of the bolsters and diaphragms engage the lower turning seats attached to the under-frame.

Another feature is an interlocking cast steel stop device just back of each underframe bolster to prevent transverse and longitudinal movement of the body due to rough handling, preventing damage to the piston rods and other parts.

The dumping of the car is controlled by three valves: the indicator valve, which indicates the side on which the car is to be dumped, is manually set by a rod passing across the car at the ends of which are index plates. This valve can be set to dump on either side or neutral.

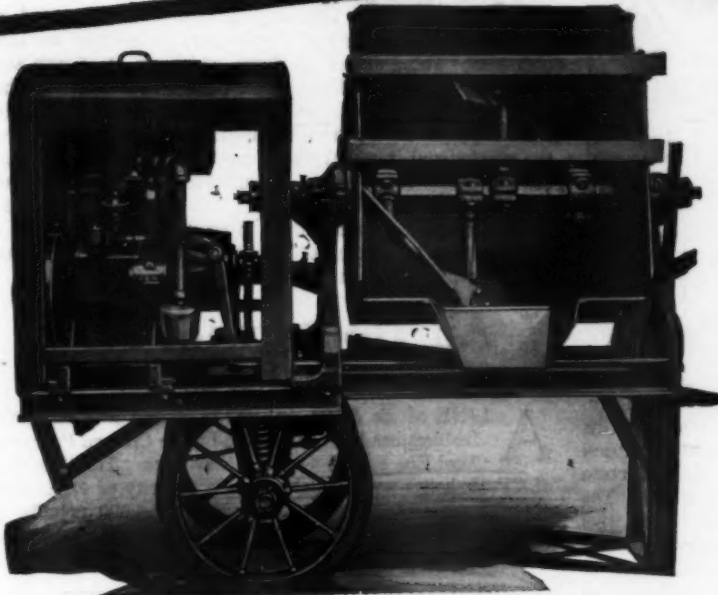
The operating valve is located at one end of the car, and when opened admits air to the set of cylinders on the side for which the indicator valve is set, dumping the car. The operating valve handle can be locked in a closed position when necessary.

The control valve allows the cars to be operated in trains, from the operating valve of any car selected in the train, and by proper setting of the indicator valve any car or cars in the train can be controlled as desired.



The New 30-Cubic Yard Koppel Air Dump Car for Sand, Stone and Other Bulk Materials

THRUADDOOR



Write today! For the new **BLYSTONE Circular**

BLYSTONE MFG. CO., Cambridge Springs, Penna.

Phone Walnut 1630

F. A. WEAKE, INC.

Contractor for
PLAIN AND DECORATIVE PLASTERING

293 Bridge Street
Springfield, Massachusetts

February 22, 1927.

Blystone Manufacturing Co.,
Cambridge Springs, Pa.

Gentlemen:

In reply to your letter of February 19th in which you ask us just what we think of the Blystone Plaster Mixer you sold to us a year ago.

We are very pleased to say this machine has given us A-1 Service. We have kept it in constant use and the results have been very gratifying as this machine paid for itself on the first job. This machine has done more than you claimed for it.

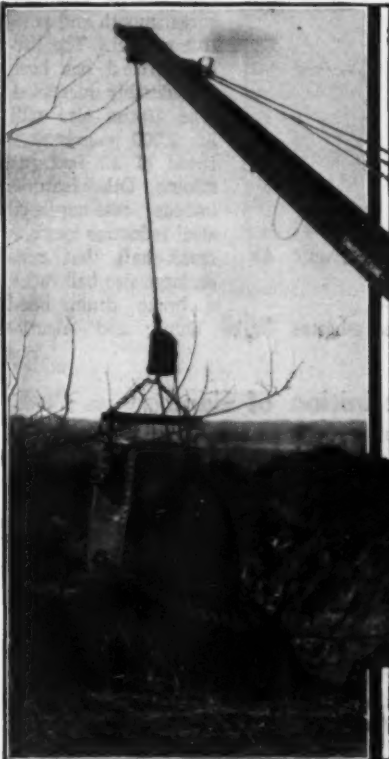
Yours very truly,

F. A. WEAKE, INC.,

By: F. A. Weake.

FAW:RN

Expected 500 Yds.—Averaged 620 Yds. Daily



"MY operator averaged 620 cubic yds. per day for 11 days on ditch work and I did not expect more than 500 yds." reports S. J. Peterson whose Universal Motor Truck Crane recently dug a ditch through hard, stiff "Missouri Gumbo" mud. Peterson's costs for operating his Universal Truck Crane are approximately \$15.00 a day. Neither his crane performance or operating costs are unusual.

Mounted on a used motor truck, a Universal possesses speedy mobility—and with the Motor Truck Crawler attachment on the truck it sacrifices none of this motor truck mobility on cross country, rough and soft ground travel. Bulletin 212-A sent if you request it.

THE UNIVERSAL CRANE COMPANY

904 Swetland Bldg., Cleveland, O.

UNIVERSAL

LARGEST and ONLY EXCLUSIVE

CRANES
DRAGLINES
SHOVELS
TRENCH HOES

BUILDERS of TRUCK CRANES



The New Ersted Automotive Crane Equipped With Clamshell and Showing Type of Dragline Bucket Used

A Full-Revolving Crane

A FULL-REVOLVING, ball-bearing automotive crane, for either truck or stationary mounting, has been produced by the Ersted Manufacturing Co., Portland, Ore. The rotating frame, base frame and boom are of structural steel, electrically welded throughout, giving the crane structure exceptional strength and rigidity, with minimum weight. The hoisting unit is the standard Model-S Ersted automotive double-drum ball-bearing hoist. This is equipped with a built-in 3-speed sliding gear transmission permitting instant adaptation of power to the requirements of load and speed. A wide range of utility is provided by the fact that the hoist may be used in place of the crane, or separately, for all ordinary hoisting operations.

More than forty New Departure quality ball-bearings incorporated in the construction of the crane eliminate friction losses and reduce the power and fuel consumption required for operation to about half that required for the operation of other cranes of corresponding capacities and speeds.

Double provision is made on these Automotive cranes to facilitate counterweighting to give the stability desired or needed for any class of work. A counterweight box, built integrally with the rotating frame, has capacity for structural steel punchings sufficient to give more than ordinary truck crane stability. In addition, provision is made for attachment of extra cast counterweights to give excess stability.

Adjustable roller stabilizers support the weight of the crane on the rear wheels, relieving the truck chassis of severe strains. The crane can be furnished equipped with any make or type of standard industrial gasoline power unit, or can readily be equipped for electric power.

A New Batcher-Type Bin

A NEW type of all steel hopper bottom bin, known as the Type B batcher bin, has recently been developed by the James B. Seaverns Co., Batavia, Ill. It is designed to come within the railroad and highway shipping limits, the body frame being 10 feet wide x 14 feet long, with removable posts or legs which are quickly set into place on arrival at the job.

The batcher gates, which are of the Duplex type, are attached directly under the hopper and above the lower chord of the main side trusses, so it is not necessary to remove them for shipment. Only the four legs and two batch hoppers are detached when folded for shipment cutting down the assembling time to about an hour with the use of a crane.

The top of the bin is 10 feet wide x 19 feet long inside, and is so arranged that various capacities are obtained simply by adding sectional side boards of pressed steel plates 12 inches in height. Each sectional unit contains just 7 cubic yards,

thus any size bin can be shipped from stock for capacities from 23 to 51 cubic yards in 7-yard variations for both sand and stone compartments.

The batch measuring and weighing hoppers are hung from a duplex strike-off gate unit operated by one hand chain for both gates. These gates are of $\frac{1}{4}$ -inch steel plate and special 10-inch steel channel construction. They are mounted on frictionless roller races and require very little effort for their operation. The drop-bottom doors, which are of $\frac{1}{4}$ -inch steel plate, are equipped with automatic latches and counterweights. When the doors are tripped, they are locked open, permitting full discharge of the hopper contents; another pull releases the weights and re-sets them for another batch. The batchers are adjustable from $8\frac{1}{2}$ to 17 cubic feet for sand and from 14 to 29 for stone. They are of $\frac{3}{16}$ - and $\frac{1}{4}$ -inch steel plate and thoroughly galvanized to prevent rusting. When so ordered, they are equipped with automatic counters to record the number of batches shipped per day.

Air Hoists with New Features

A LINE of air hoists embodying several new distinctive features has been announced by the Chicago Pneumatic Tool Co., 6 East 44th St., New York. The three sizes of CP air hoists now available have a capacity of 2,000, 3,000 and 4,000 pounds, respectively, and have an enclosed type load block.



The New Chicago Pneumatic Air Hoist

The air motor is a 4-cylinder, single-acting unit and practically vibrationless. Being compact, these hoists require less headroom than customarily needed. A balanced-type control valve assures smooth and positive control. The lifting speed has been considerably increased. The 10-ton size will lift 2,000 pounds at a speed of 40 feet per minute. Other features include case-hardened steel reduction gears, a crank-shaft that runs on large size ball races, a brake drum lined

with Johns-Manville asbestos brake lining, and Alemite lubrication.

Definition of Sand

THE definition of the term sand, published as standard in 1926 by the American Society for Testing Materials, was recommended for advancement to standard at the recent convention:

Sand.—The fine granular material (usually less than $\frac{1}{4}$ in. in diameter) resulting from the natural disintegration of rock, or from the crushing of friable sandstone rocks.

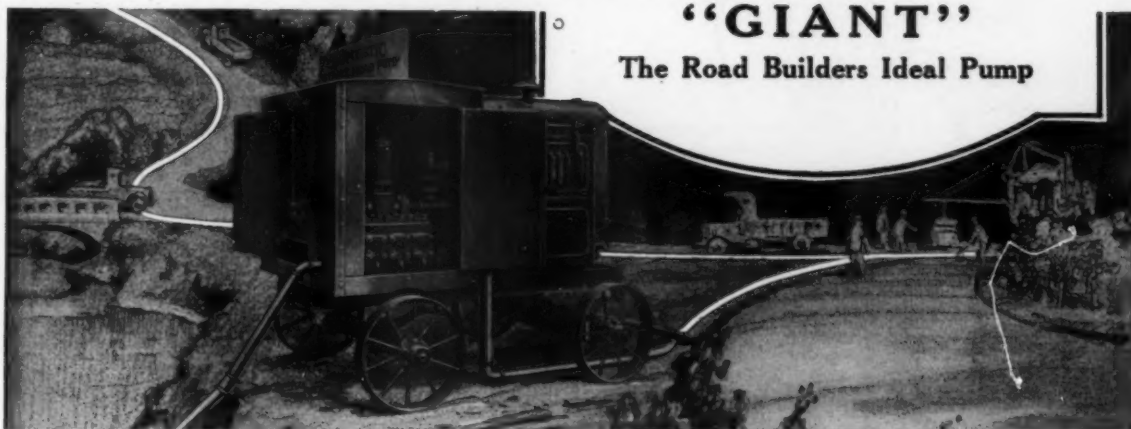
NOTE.—When used without a qualifying adjective, the term sand is generally understood to mean the product of the natural disintegration of siliceous or calcareous rock. Sand should be distinguished from screenings, gravel, etc. The size of particle and other physical characteristics should be taken care of in specifications. The fine material resulting from the crushing of blast-furnace slag is known as "slag sand."

The Heart of any paving job—"The Pump"

—and be sure it's dependable—investigate the

"GIANT"

The Road Builders Ideal Pump



Upon the dependability of the Pump hinges *profit* or *loss* on your paving job. You cannot afford to take a long chance so avoid costly delays—caused by inadequate water supply—by taking out "water insurance" in a "GIANT" self-oiling Triplex Pump. Capacity 60, 80, 100, 150 big, steady gallons per minute, pressures up to 500 lbs.

— Special descriptive booklet gladly sent on request —

OEM 8-38

DOMESTIC ENGINE & PUMP CO.,

N. Queen St. & P. R. R.
Shippensburg, Penna.

ANYONE CAN USE THEM

WITH Bates Wire Bar Ties and a Bates Tying Tool, an unskilled laborer can tie reinforcing rods as securely and quickly as an expert.

On some of the largest reinforced concrete jobs in the country, the use of Bates Ties and Tools has cut rod-tying time in half and reduced the labor cost for this operation to a minimum.

Save money! Write now for a free trial outfit of one Tying Tool and sample Ties in assorted sizes and test their advantages yourself.

**BATES VALVE BAG
CORPORATION**

35 E. Wacker Drive Chicago, Ill.

BATES WIRE BAR TIES





The New Chausse Wheelbarrow Oil Burner Torch

Kerosene Burner Tank Mounted Like Wheelbarrow

THE increasing use of kerosene torches in municipal, railway and highway services has resulted in the production of these torches with large capacity tanks which are too heavy for one-man operation. To avoid the necessity for employing two men in using such kerosene burners, the Chausse Oil Burner Co., Elkhart, Ind., has announced a model arranged similar to a wheelbarrow. This outfit can be easily transported by the man who requires it in his work.

A conventional type welded steel tank with a capacity of 14 gallons of kerosene is mounted in tubular steel shafts with a single wheel. To the tank which has a self-contained air pump and pressure gauge, is attached the kerosene burner by means of heavy duty pneumatic tool hose. The burner handle is steel with a wooden grip and a convenient needle valve.

This burner is self-generating and produces a heat temperature from 1,750 to 1,800 degrees Fahrenheit. The volume of gas is considerable which makes this outfit adaptable to such work as preheating prior to welding, thawing frozen piping, melting snow on tracks and switches and wherever an intensely hot, voluminous flame is desired.

An Open Seat Flap Valve

AN open seat flap valve designed particularly for sewer outlets, sewer and water lines and sewage disposal plants as a safeguard against the back flow of sewage is being marketed by the Josam Manufacturing Co., 4900 Euclid Bldg., Cleveland Ohio. This flap valve is placed at the discharge end of the sewer line, and is said to be instantaneous in action and to seat positively. It is open about $\frac{3}{4}$ -inch under normal conditions, permitting flow under the most sluggish conditions, instantly closing

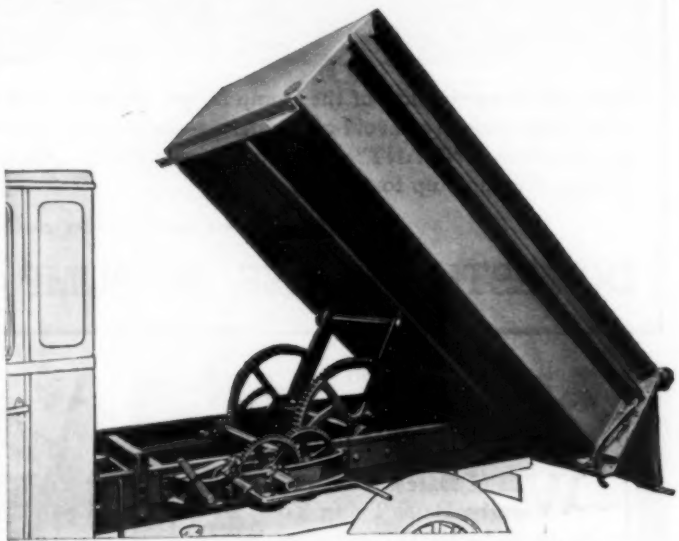


The Josam Open Seat Flap Valve Sewer Outlet

against the slightest backflow and gradually opening to full water way of the pipe as demanded.

In sewer lines the open seat flap valve can be placed at the manhole, thereby preventing backflow along the line, but indicating stoppage of the line by forcing the water to rise in the manhole to the street surface. As a sluice, river or tide-water outlet, its sensitive action is a worthwhile feature. The Josam flap valve is also recommended for use between settling basins in sewage disposal plants.

The body is extra heavy cast iron and the entire flap mechanism, disc, disc hanger, compound acting fulcrum bearings and disc seat is bronze. The disc is free to revolve insuring constant positive seating under any conditions. The flap valve is an adaptation of the Josam open seat back water sewer valve which is designed for installation in the sewer lines. In addition, that portion of the valve body directly beyond the disc is offset $1\frac{1}{2}$ inches below the valve seat which precludes the possibility of fouling the valve.

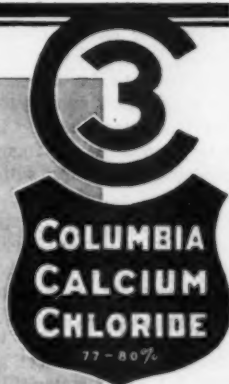
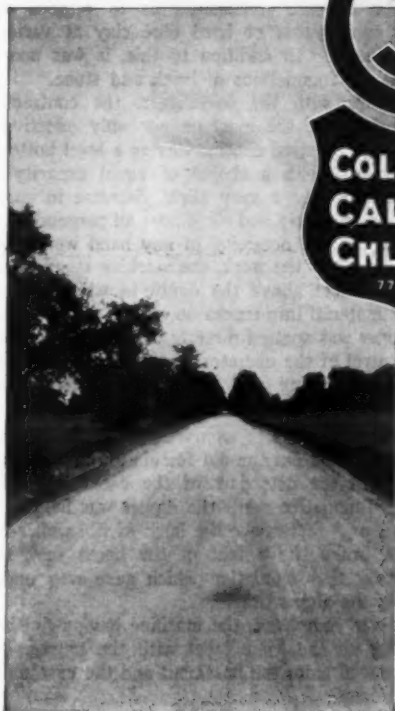


The Heil Hand Hoist and Model 90 Dumping Body

A New Hand Hoist and Dump Body

A HAND hoist has its legitimate place in the dump hoist field. It meets a specific need for efficient hoist equipment on light duty trucks at a cost in keeping with the service it is expected to render. Heil hand hoists and dump bodies, made by the Heil Co., Milwaukee, Wis., for light duty trucks, are added to the truck chassis without impairing or affecting the performance of the truck for general hauling. The hand hoist is designed to assume positive action with the least operating effort. A set of driving gears, cut on a Fellows Shaper, accurately mesh with little friction. Two gear segments, to which are bolted the lifting arms, are operated by the driving gears. An ingenious combination of roller and angle track grip on the ends of the lifting arms allowing free travel along a steel track which is riveted to the longitudinal body members, and eliminates "body jumping" while riding light or the possibility of back tipping when the body is in a dumping position.

The body may be held at any desired angle by the two-way hoist lock provided. A double crank sprocket arrangement makes it possible to dump a light load unusually fast by inserting the crank in the direct gear sprocket. With 48 turns of the handle in the low gear socket the body can be



Lay the Dust- and Lower Road Upkeep!

Treating the gravel roads with "3-C" Calcium Chloride serves an important two-fold purpose.

"3-C" spread upon the surface of the road keeps it moist and effectively suppresses the dust.

And by keeping the dust down on the road, it packs under traffic and becomes an excellent binder—reducing maintenance expense.

CURING CONCRETE ROAD

"3-C" Calcium Chloride saves time and money in curing concrete by hastening the "set" and increasing strength and density.

We have for free distribution informative booklets on the use of Calcium Chloride for dust prevention and concrete curing. Write for copies.

COLUMBIA CHEMICAL DIVISION
Pittsburgh Plate Glass Co.
BARBERTON, OHIO

KEEP OUT OF THE HOLE



Have you ever considered accidents in terms of production cost . . . ?

Follow the example of many thousands of contractors, state and county highway departments, public utilities, etc., who have made themselves safe from this danger

by using



it is

Unbreakable - Storm-proof
Economical - Theft-proof
Endorsed by Insurance Co's.



Sold by principal dealers everywhere

Direct inquiries answered with complete information and a useful souvenir

The Toledo Pressed Steel Co.
12th and Woodruff Toledo, Ohio

raised to a full 45-degree dumping angle. Ten turns of the crank handle in the direct gear socket accomplishes the same result. A friction brake controls the return of the body to the lowered position.

The entire hoist mechanism is permanently mounted on a channel iron frame which is easily attached to the truck chassis frame with U-bolts. Hard wood sills act as cushions for the hoist frame and for the body.

The Model-90 body has a capacity of 42 cubic feet, and is either 7 or 8 feet long, depending on the kind of truck. It is 3 feet, 11½ inches wide in front, tapered to 4 feet, 1½ inches in the rear. The body and hoist complete for the 7-foot unit weighs 1,000 pounds and for the 8-foot unit 1,050 pounds.



One of 36 Caterpillar Tractors Owned by Contractors Engaged in the Construction of the New 700-mile, \$96,000,000 Central Highway in Cuba

Cellar Digging with a Trenching Attachment

AN unusual way of digging a basement has just been successfully used by Trifiletti Brothers of Lorain, Ohio, using a Thew Lorain-75 backdigger made by the Thew Shovel Co., Lorain, Ohio. Following a disastrous fire in one of

the city's business sections in which several buildings were destroyed, the owners of the property decided to wreck the remaining walls and erect one building on the site. The new building was to be of such dimensions as to require the removal of 5,000 cubic yards of hard blue clay at various depths from street level. In addition to this, it was necessary to remove the old foundations of brick and stone.

In doing this work with the backdigger, the contractor found to his surprise that the machine not only effectively dug the material at all required depths, leaving a level bottom, but that in comparison with a shovel of equal capacity it could load trucks with only a very slight decrease in speed and daily output. With the tip and tilt dipper all perpendicular walls were dug without the necessity of any hand work. At one period in the course of the work, the machine stood on an intermediate level 11 feet above the depth to which it was digging and loaded material into trucks on a bank 9 feet above the level. The dipper was spotted directly over the trucks and being under the control of the operator was tilted to unload in that position without spilling any of the earth around the trucks.

It required six working days to complete the cellar excavation. This includes tearing out the old foundation and digging perpendicular walls in the new part of the excavation. In tearing out the old foundation walls the dipper was held with the teeth vertical, 2 or 3 feet above the back of the wall. By releasing the hoist brake the weight of the boom sunk the teeth well down over the foundation which gave way under the powerful pull of the dipper dragline.

When the work was completed, the machine having finished digging and loading on the same level with the trucks, did not have to be removed from the basement and the customary ramp taken out by hand.

The most interesting part of the contract came when the cost was summarized. The machine working from the higher dry levels did not require timber mats. Vertical digging eliminated extra hand labor. Loading trucks on street level saved time in turning them on the bottom of the excavation and pulling up grade to the street. The old foundations were wrecked and loaded in the regular course of the work and required no extra time or labor. One day of rain did not stop operations since the machine and trucks were both operating on street level at that time.



CELLAR EXCAVATION COMPLETELY HANDLED WITH A POWER SHOVEL

Left, loading the truck located at ground level with dirt excavated from intermediate level. Center, shovel operating from street level and digging at low point. Right, vertical excavation handled by power shovel

ROGERS

HEAVY DUTY

TRAILER

Here's a 40-ton Buckeye trench excavator to be moved. Is there going to be any difficulty in transporting it to the next job? ***There is not!***

ROGERS Heavy Duty Trailers are use to heavier loads than this. Even a 70-ton transformer can be easily moved with a ROGERS on the job.



*Write for
complete
information*

**ROGERS
BROTHERS
CORP.**

Albion, Penna.

A Marvel of Simplicity



Star's operating convenience saves time—speeds up the work. All levers and controls are within easy reach of the operator's seat. The Star is also serviced with ease. Entire transmission assembly and revolving deck mechanism are opened for easy access when crowding shaft is forward on the rack.

In its entire design the Star Power Shovel embodies this idea of simple, rugged construction and operating convenience.

Its efficiency will be a revelation to you. Write today for complete details.

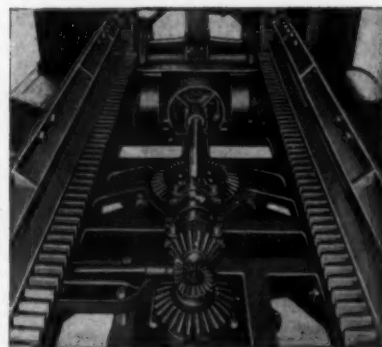
The Star Drilling Machine Co.

505 Washington Street, Akron, Ohio

The Star Power Shovel

Skimmer—Grader—Ditcher
Backfiller—Crane

**Supreme in
Ease of Operation!
Accessibility!**



This view shows simplicity of the gearing—and easy access to mechanism with crowding shaft moved forward.

Help for Contractors

These especially selected catalogs and pamphlets of value to contractors are for free distribution. You will find it worth while to check these lists each month and write for the catalogs you need.

LOCOMOTIVES FOR ALL PURPOSES

Brookville locomotives, 10-20 and 15-30 McCormick-Deering driven, that are made in capacities of 5, 6, 8, 10 and 12 tons, with three forward speeds and three reverse speeds, are thoroughly described and illustrated in Bulletin B-11 of The Brookville Locomotive Co., Brookville, Pa.

A ROAD ROLLER OF HIGH STANDARDS

The Kinney Roadroller that is the Fordson body in exceptionally rugged, flexible and useful roller form, for ground conditions that are rough and hard, or soft and treacherous, in capacities of 2, 3, 4, 5 and 6 tons, is described in a circular of Kinney Standards, Inc., 118 Quincy Street, Brooklyn, N. Y.

AN ELECTRIC HAND SAW

The Super Porto electric hand saw of the Portable Power Tool Co., 2634 So. Dearborn Street, Chicago, Ill., that will cut everything that anybody who has anything to cut, and has many desirable and safe features, is described in a circular of the company that is available to interested contractors and engineers.

A NEW MOUNTING FOR ARC WELDER

A new mounting of the Standard Lincoln Electric Stable Arc welders, which attaches to either the McCormick-Deering 10/20 or Fordson tractors and gives a 4-wheel rubber tired self-propelled unit capable of hauling heavy loads behind itself, is described in literature of the Pontiac Tractor Co., 2842 W. Grand Boulevard, Detroit, Mich.

HAMMERS FOR HARD WORK

Union Junior and Midget hammers, in sizes 8 and 9, for driving 2- and 3-inch wood sheeting, and that actually consume 32 and 40 cubic feet per minute, respectively, at 90 pounds pressure, are described and illustrated in Bulletin No. 104 of the Union Iron Works, Inc., Hoboken, West Shore Siding, N. J.

A NEW BATCHER-TYPE BIN

A new type of all steel hopper bottom bin, known as the Type "B" batcher bin, that has batcher gates of the Duplex type, and many desirable and economical features, has been put into production at the new plant of the James B. Seavers Co., Batavia, Ill., and is described in literature that is available on request.

A NEW HEAVY-DUTY TRACTOR UNIT

The Model DH Trackson McCormick-Deering unit, that is a powerful, energetic-giant for work in the most difficult places, and that is marked for its simplicity of design, strength of construction, and almost perfect balance, is described in literature which the Trackson Co., 519 Clinton Street, Milwaukee, Wis., will be glad to send on request.

AUTOMATIC BELT CONVEYORS

Descriptive bulletins of the Chicago Automatic Conveyor Co., 1853 South 53th Avenue, Cicero, Ill., will be sent to parties interested in automatic portable and stationary belt and bucket type conveyors and loaders, and shaker screens, that are cutting loading and unloading costs for thousands of contractors.

HOISTING UNITS THAT ARE SAFE AND ECONOMICAL

Clyde hoisting units that regardless of motive power incorporate every proved device that tends to safety and economy in operation are described in literature which the Clyde Iron Works Sales Co., Duluth, Minn., will be glad to send on request.

PORTABLE, EASILY HANDLED CONCRETE FINISHERS

One man can do the work of four rubbing by hand, with a Berg concrete surfacer and finisher that is portable, easily handled, pays for itself in a short time, and is used on many of the biggest concrete jobs in the country. It is described in literature of The Concrete Surfacing Machinery Co., 4669-71 Spring Grove Avenue, Dept. F, Cincinnati, Ohio.

TAR AND ASPHALT HEATERS

The Blue Book of Connery & Co., Inc., 4000 N. Second Street, Philadelphia, Pa., illustrates the complete line of tar and asphalt heaters, oil burning kettles, pouring pots, torches, hand spraying attachment, etc., of that company.

TILTING MIXERS WITH LOADER SKIPS

Catalogs on the following machines are available on request to the Construction Machinery Co., 447 Vinton Street, Waterloo, Iowa; tilting loader models, 3½-S, 5-S, 7-S, 10-S, 14-S; tilting trailers, 3-S, 3½-S, 5-S with auxiliary; non-tilt mixers; hoists for plaster. A desirable feature of the Wonder mixer of this company is the loader skip that empties every bit of material in each batch into the drum of the mixer.

DEPENDABLE POWER FOR EVERY PURPOSE

Red Seal Continental motors that give the user the dependable power that means greatest economy on big jobs, and that will do the job with efficiency and dependability that is so vital to present day profits, are described in literature of the Continental Motors Corp., Industrial Equipment Division, Muskegon, Mich.

A MIXER WITH NEW FEATURES

A mixer that is automatic in its operation of loading and discharging, that can be turned around in its own length and has an automatic side-loader built in, is described in literature of Norris K. Davis, San Francisco, Calif.

COLD BLAST LANTERNS THAT BURN 70 HOURS WITHOUT REFILLING

The Dietz "Little Giant" cold blast lantern that burns 70 hours without refilling, that is as faithful as a bonded employee and will stay lighted in any kind of weather over a 3-day week-end or holiday, is described in literature of the R. E. Dietz Co., New York.

WATERPROOF GRAPHITE GREASE

Waterproof graphite grease that is of dense consistency, suitable for general heavy service with slow speeds and heavy pressure, that possesses a remarkable adhesiveness and cannot be washed off, even by running water, sea water, or alkaline and sulphuric mine water, and is a rust preventive, is described in Circular 148-W of the Joseph Dixon Crucible Co., Jersey City, N. J.

A MAGNETO FOR CONSTRUCTION EQUIPMENT

Eisemann magnetos that are used by builders of high quality equipment throughout the country and are favored by contractors everywhere, are described in literature which the Eisemann Magneto Corp., 165 Broadway, New York, will be glad to send on request to interested engineers and contractors.

ECONOMICAL PIPE CUTTERS

When the emergency arises you may save the cost of the Ellis pipe cutter on one job, as many other contractors have done. This pipe cutter comes in two sizes: No. 01 cuts all kinds of pipe 4 inches to 8 inches; No. 1 cuts all kinds of pipe 4 inches to 12 inches. It is described in a circular of the Ellis & Ford Manufacturing Co., 32 Piquette Avenue, Detroit, Mich., which is available on request.

AUTOMOTIVE BALL-BEARING HOISTS

A catalog of the Ersted Manufacturing Co., Portland, Ore., describes Ersted automotive hoists that have three speeds, are ball-bearing, are built for capacity and strength, serviceability and efficiency, and are made of correct design, and superior materials and workmanship.

8½ PER CENT STRONGER CONCRETE

The Hunt Process of concrete curing, that cures without dirt or water and makes it 8½ per cent stronger, that enables concrete to be walked on and used sooner than is possible by old methods, waterproofs the surface, eliminating frost flaking in cold weather, is described in literature which the Ever-lasting Paint and Sales Co., 1110 Board of Trade Building, Los Angeles, Calif., will be glad to send on request.

A CONCRETE CART AXLE THAT WON'T WEAR OUT

The axle of the 1928 General concrete cart is unbreakable and will not wear out in service because of an exclusive removable axle bushing, and is described in Bulletin No. 401 which shows the axle bushing and 11 other advantages of the products of the General Wheelbarrow Co., 3140 East 65th Street, Cleveland, Ohio.

A FULL LOAD DUMPED IN 15 SECONDS

Heil Hydro hoists that are fast, dump a full load in less than 15 seconds, that do a good clean dumping job and afford greater profits and lower maintenance costs, are described in literature which The Heil Co., 1242-60 26th Avenue, Milwaukee, Wis., will send on request.

TAR HEATERS BUILT FOR SERVICE

All styles of portable and stationary tar heaters, in capacities of 25 to 2000 gallons, are described in literature of The Jos. Honhorst Co., 1016 W. 6th Street, Cincinnati, Ohio. Pamphlet No. 15 describes particularly the new oil burning heater of that company.

4-CYLINDER MOTOR ROLLERS

The Huber Motor Roller Catalog of The Huber Manufacturing Co., 330 Center Street, Marion, Ohio, is available to those who are interested in powerful and dependable 4-cylinder motor rollers that are quick in action, economical to operate, and made in 4 sizes: 5, 7, 10 and 12 tons capacity.

INSPECTION, TESTS, AND CONSULTATION

The Robert W. Hunt Co., Engineers, Chicago, Ill., will be glad to supply information on the many services they render contractors and engineers. These services include: tests of all reinforced concrete materials, designing of concrete mix and checking the placement of reinforcements, supervision of all classes of concrete construction, and crushing of concrete test cylinders to assure safety in the removal of forms.

HOIST FOR SEWER TUNNELING JOBS

Type "NH" single and double-drum, gasoline and electric hoists, for sewer tunneling and other construction work, are described and illustrated in Technical Data Sheet No. 121 of the Novo Engine Co., 216 Porter Street, Lansing, Mich.

NEW BOOKLET ON PAVEMENT REPAIRS

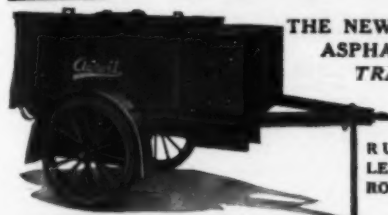
A most interesting autobiography by A. Chuck-hole under the title "The Life, Adventures and Death of a Pest" has been prepared by the Austin-Western Road Machinery Company, Dept. 1105, 400 North Michigan Ave., Chicago, Ill., for free distribution to municipal officials. The book is particularly well written, is interesting and describes in an interesting manner the liabilities of holes in city pavements.

A NEW MODEL DRAGLINE

A more durable, easier running and easier operated dragline, No. 60, that is offered with the Waukesha 60-horsepower motor, and is distinguished by several new features, is described in Vol. 3, No. 5 of "Russell News" of the Russell Grader Manufacturing Co., Minneapolis, Minn., will be sent engineers and contractors on request.

Aerol

ASPHALT HEATERS



THE NEW AEROIL
ASPHALT KETTLE
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RUBBER TIRES
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Melts and heats pitch or asphalt in one-half the time required for woodfires. Made in the following sizes: 25-50-65-75-100-110-150-165 gallons capacity.

Can also be had on legs and on wheels without rubber tires. Write for full particulars on type and size to meet your requirements

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"The Strongest Geared Power
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Capacity
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POSITIVE
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Weight
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Two Speeds
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Lower Your Costs—WIN More Jobs



"American" portable woodwork-
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Saw Rigs and Hoists.

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For Hand Operation
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Equipment for Every Size Plant
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Let Hayward Engineers rec-
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Do you investigate the operating costs of your
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Contractors who closely investigate operating costs report
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Patented features, exclusive with the Milburn Light, are
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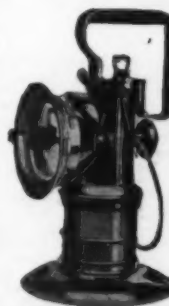
Write for information as to the EIGHT POINTS which will
help you save money with Milburns.

Ask for booklet No. 2238 on "Lights" and 3238 on "Welding
and Cutting Apparatus."

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This remark by a railroad man ex-
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SALES CORP.**

342 MADISON AVE., NEW YORK

A 1/2-BAG SEMI-TRAILER MIXER

The 1/2-bag semi-trailer mixer of The John Lauson Manufacturing Co., 11 Jackson Street, New Holstein, Wis., has semi-automatic discharge, convenient large hand wheel, dependable lock, blades that knead and stir, slats that give large clearance for water, drum spindle mounted on bronze bushings, and Alemite lubrication throughout. It is described in literature of the company.

PORTABLE WOODWORKING MACHINES

"American" portable woodworking machines that cut down costs on jobs and that are used by hundreds of contractors right on the job, are described in literature which the American Saw Mill Machinery Co., 171 Main Street, Hackettstown, N. J., will be glad to send on request.

A FREE TOUR OF 80 CONTRACTING JOBS

The 1928 edition of "Contracting with Barber-Greene" will give you a free inspection tour of over 50 progressive contracting jobs, without going outside your own door. This is available on request to the Barber-Greene Co., 485 W. Park Avenue, Aurora, Ill., manufacturers of portable belt conveyors, self-feeding bucket loaders, coal loaders, automatic ditch diggers, coal feeders, etc.

THE STRONGEST GAINED POWER FOR ITS WEIGHT IN THE WORLD

That is what the manufacturers of B. B. hoists have to say about their 5-ton capacity straight line hoist with positive internal brake, that weighs 110 pounds, and has two speeds, 4 to 1 and 24 to 1. Write to Beebe Bros., 3219 First Avenue, South, Seattle, Wash., for descriptive circular with users' endorsements and name of nearest dealer.

WOULD YOU LIKE TO SAVE MONEY ON YOUR MIXING JOBS

Literature describing Thrudoor Blystone mixers for plaster, mortar or concrete, that will save the daily wages of several laborers, enables you to wheel the mixer from job to job, will go through any 30-inch doorway or 6-foot floor opening, will be gladly sent to interested contractors and engineers by the Blystone Manufacturing Co., Cambridge Springs, Pa.

DEPENDABLE POWER

Dependable service year in and year out is the outstanding feature of LeRoi engines that come in capacities of 3 to 160 horsepower and are described in literature of the Le Roi Co., Milwaukee, Wis., that is available to interested contractors and engineers.

PILE HAMMERS FOR THE HARDEST JOBS

Bulletin 37 of the McKiernan-Terry Drill Co., 19 Park Row, New York, describes McKiernan-Terry pile hammers that were used on the Hudson River Bridge job to pull 75- to 85-foot sheet piling from the cofferdams of the Bridge where they were bonded to 30 feet of concrete on both sides. A copy of the bulletin will gladly be forwarded by the manufacturer.

A SHOVEL, HOE AND DRAGLINE

Write to the Manitowoc Engineering Works, a division of the Manitowoc Shipbuilding Corp., Manitowoc, Wis., for literature describing the Moore Speedcrane, a speed shovel, trench hoe and speed dragline, which they are now manufacturing and selling.

ACCURACY IN METERS

Neptune meters, the "cash registers of the water works field," that have a reputation for sustained accuracy in service, are described in literature which the Neptune Meter Co., 50 East 42nd Street, New York, will be glad to send on request.

REINFORCED CONCRETE PIPE

Newark reinforced concrete pipe that is laid in minimum time, at minimum expense, with minimum effort, and when laid, has a minimum resistance to flow, because the inside of each joint is so smooth, is described in literature and illustrated in sketches which the Newark Concrete Pipe Co., 462 Broad Street, Newark, N. J., will send on request.

CONQUERING DUST

This is the name of a booklet that tells all about "J-C" calcium chloride that quickly and easily abolishes the dust nuisance and at the same time is an economy measure from the standpoint of road maintenance, and is obtainable in handy bags of 100 pounds or steel drums containing 350 pounds. The Columbia Chemical Division of the Pittsburgh Plate Glass Co., Barberton, Ohio, will gladly send the booklet on request.

STEEL TOWERS AND CHUTING PLANTS

Bulletin 203 of the Ransome Concrete Machinery Co., Dunellen, N. J., tells all about Ransome steel towers that carry a boom plant with a 48-foot counterweight chute, having its inner end tied down, and at the unsupported outer end a 48-foot swivel head chute. This bulletin will be sent to interested contractors and engineers.

A PORTABLE TIMBER SAWING MACHINE

Cutting 12 x 12-in timber piles with the air-driven Wolf portable timber sawing machine with a Model "A" Ingersoll-Rand motor and capacity of 24-inch diameter timber, weighing 93 pounds, is described in literature which the Reed-Prentice Corp., Worcester, Mass. will send on request.

DRAINAGE CASTINGS

The new Josam catalog G, issued by the Josam Manufacturing Co., 4900 Euclid Bldg., Cleveland, Ohio, contains complete descriptions, illustrations, detailed drawings, recommending uses and sizes and weights of every Josam product. It is well illustrated and contains a chart of strainers for Josam drains, an explanation of Josam double drainage drains with pictures and specifically covers Josam drains, Josam-Marsh grates, plaster and hair interceptors, Josam open seat swing check valves, Josam open seat back water sewer valves, Josam combination closet fittings and bends with cast closed end.

A POWER SHOVEL WITH TELESCOPING HANDLE

The Star power shovel with patented telescoping handle with skimmer, grader, ditcher, backfiller and crane attachments, that is an efficient, profitable performer on all kinds of jobs, can work in very close quarters, revolving completely in 22-foot circles, that has 11 feet of horizontal crowd, teeth always in front, and full 1/2-yard scoop with large overload capacity, high lift and full-length track wheels, is described in a catalog of The Star Drilling Machine Co., 505 Washington Street, Akron, Ohio.

WHEELBARROWS THAT ARE CHEAPER PER JOB

Sterling wheelbarrows that have self-lubricating bearings, 10-spoke wheels, malleable iron brackets, smooth wheel face and wrought steel hub as well as handle clamps that reinforce the handles and give longer life, are described in literature of the Sterling Wheelbarrow Co., Milwaukee, Wis.

JACKS THAT ARE SIMPLE, SAFE AND STRONG

Simplex jacks that are high in man-power, quality, safety and simplicity, and that are made in various types and sizes, as well as Simplex trench braces, are described in literature which Templeton, Kenly & Co., Ltd., 1020 So. Central Avenue, Chicago, Ill., will be glad to send to interested parties.

WHEELBARROWS FOR MAXIMUM LOADS AT MINIMUM LABOR

Bull Frog wheelbarrows that handle maximum loads with minimum labor because exclusive features of design and construction are engineered into them, as well as Bull Frog carts and scrapers for every contracting use, are described in a catalog of The Toledo Wheelbarrow Co., 69 E. Wacker Drive, Chicago, Ill.

CURE BARS FOR CONCRETE PAVEMENTS

Truscon curb bars that are specially rolled steel sections with their thick protecting faces placed in the curb forms before concrete is poured and so become an integral part of the construction, and give to the curb a wearproof, shockproof nose that is permanent assurance against cracking and chipping, and are furnished in standard lengths of 8 feet, 10 feet and 12 feet and supplied bent to radius for corners, are described in the 184-page illustrated hand book "Modern Road Construction" of the Truscon Steel Co., Youngstown, Ohio.

CLUTCHES THAT PROTECT AGAINST SHOCKS AND STRAINS

Twin Disc clutches that have large frictional areas and great reserve capacity enabling them to absorb excess loads by slipping without siezing or overheating, and that, where the starting torque is greater than the power of the motor, enables the load to be lightened until the driven member attains full speed, and that are easily maintained in perfect adjustment without the use of tools, are described in literature of the Twin Disc Clutch Co., Racine, Wis.

WATER METERS, VALVES, STOPS, ETC.

Catalog G-57 of the Union Water Meter Co., Worcester, Mass. describes water meters, valves, stops, pipe lining equipment and fire whistles of that company, and is available on request, to interested contractors and engineers.

CRANES FOR DEPENDABLE PERFORMANCE

Bulletin 36-R of The Universal Crane Co., 901 Sweetland Building, Cleveland, Ohio, shows many of the jobs on which Universal cranes give a reliable money making performance of hard, constant service. The bulletin is available on request.

CAST IRON PIPE FOR PERMANENCE

The United States Cast Iron Pipe Handbook of the United States Cast Iron Pipe and Foundry Co., Burlington, N. J., gives much helpful data for the engineer and contractor, telling all about cast iron pipe for permanence where the lines will be practically inaccessible after installation as used in the Dix River gorge on completion of the power dam of the Kentucky Hydro-Electric Co. This handbook will be sent to parties interested.

CHLORINATORS FOR SAFETY AND RELIABILITY

Solution feed chlorinators that guard the public health, destroying the microbes of disease and making drinking water safe to drink, are described in technical publication No. 74 of Wallace & Tiernan Co., Inc., Newark, N. J.

STEEL SHEET PILING

Write to Wemlinger, Inc., 149 Broadway, New York, for information and expert engineering advice on steel sheet piling that is rented, sold and bought by that company.

SHOVELS THAT ARE UNUSUALLY STRONG

Unusual strength where strength is needed has been built into every Lorain machine of The Thew Shovel Co., Lorain, Ohio, as well as other desirable features, that are described in literature of that company.

INSPECTION OF CREOSOTED POLES

The Pittsburgh Testing Laboratory, Pittsburgh, Pa., has just issued a new booklet "Inspecting Creosoted Pine Poles and Piles" which gives complete details regarding this company's careful, conscientious and practical inspection of creosoted materials.

REMOVABLE BODY FOR HAND TRUCKS

The Re-Bo removable body for hand trucks which transforms the handling of packaged, boxed or bagged goods into a system that materially speeds up work is described in literature which may be secured on request from the Re-Bo Co., Inc., Syracuse, N. Y.

A NEW ASPHALT KETTLE TRAILER

A new asphalt kettle trailer with rubber tires, leaf springs, and roller bearings, that melts and beats pitch or asphalt in one-half the time required for woodfires, that comes in sizes of 25 to 165 gallons capacity, and that can also be had on legs and on wheels without rubber tires, is described in literature of the Aeroil Burner Co., Inc., West New York, N. J.

A POWER OPERATED BUILDDOZER

The Miami Trailer-Scraper Co., Troy, Ohio, has announced a new power operated bulldozer, for use with a two ton Caterpillar Tractor. Complete information regarding the effectiveness, speed and time saving qualities of this bulldozer may be secured direct from the manufacturer.

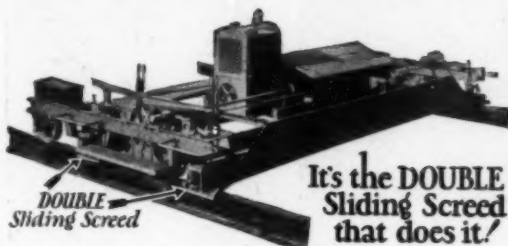
A PNEUMATIC DRILL BUILT ON NEW PRINCIPLES

A new principle, resulting in lower operating cost, with reduction in weight, eliminating the pressure tank, valves, etc., has been incorporated in the "New-Matic" machine of the Oulton Machine Corp., Bellows Falls, Vt., and is described in literature which will be sent on request to interested contractors and engineers.

AN ALL STEEL DUMP BODY

A roll-back of 21 inches on the body sub-frame before the load is finally dumped, and an automatic roller lock are the outstanding features of the new line of all steel hand hoist dump body equipment of The Galion Allsteel Body Co., Box 15, Galion, Ohio, which is described in an illustrated circular of the company that will be sent on request.

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Will build a better road, with fewer men and in less time than any other method. Particularly effective with dry concrete. The positive, even motion of the double sliding screeds kneads the aggregate into a compact mass without working the lighter materials up to the surface.

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